FINAL ENGINEERING REPORT

October 10, 1962

PRODUCTION ENGINEERING MEASURE FOR PRECISION HIGH STABILITY RESISTORS

INTELLUX, INC.

OBJECT

To obtain Pre-production approval, in full compliance with the requirements of the applicable MIL Specification and the performance and delivery of a pilot run production.

Contract No. DA-36-039-SC-72722 - Order No. 53881-PHILA-56-81-41

Contract No. DA-36-039-SC-72723 - Order No. 53882-PP-56-81-41

PREPARED BY:

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ABSTRACT:

In reviewing the engineering requirements of the contract we find that four basic problems existed:

No. 1 Construction of the resistor.

No. 2 Glass base problem.

No. 3 Glass frit problem.

No. 4 Methods of improving evenness by spraying techniques.

Each of these problems are analyzed.

Schedule A equipment of a non-standard design is illustrated and described.

The pilot runs were successfully finished October 10th and these results are analyzed. Copies of test results are included as an appendix.

No. 1 CONSTRUCTION OF RESISTORS

The original construction contemplated for the resistors was a glass sandwich with swedged leads in between. (Quarterly Report No. 4) The construction had been proven out using window glass as a substrate material for the resistor film. With window glass the frits were available to exactly match the base and therefore multiple coats of frit were used to hermetically seal the resistor film. These units were tested on polarization, humidity, and all other MIL tests and had no problems except on load life due to the window glass base. The only requirement was to substitute a good electrical glass for the window glass base and this would provide a unit that would pass the MIL 10509 specification.

Proper electrical glass was purchased from Corning Glass Company in February of 1956, some months before this contract was awarded. We were assured that a properly matching frit would be no problem to attain.

In the succeeding months several types of frit were sent to us but all of the frits were too high in expansion or softening point to fit the base glass that was made. The maximum thickness of available frit that could be fused onto the Corning base glass was .001 thick because of excessive strain. This was not enough to seal the film since small pin holes and certain other imperfections in the frit provided a direct path to the film.

In our window glass experience it was found that four separately fired coats of frit giving a total .004 thickness were necessary to guarantee a hermetically sealed unit. Attempts to use the Corning glass with one coat of frit and overprinting with a resin to fill in the voids in the frit were tried. These were only partially successful.

The approach of using a low melting point frit to seal the two glasses together was tried (Quarterly Report No. 4 and No. 6). In this approach it was found that the temperature required to fuse the low melting point frits was enough to change the resistance value and bring it out of tolerance. The lowest temperature frits we were able to obtain that would not provide too great a mismatch were about 800°F. This temperature created other problems as oxidization of the copper leads and destruction of the tin on the copper surface. After fusing, the oxide on the leads had to be acid etched or sandblasted, neither of which proved satisfactory in order to solder dip the leads to restore them to their original condition. This approach was abandoned when it was found that the problems cited could not be overcome.

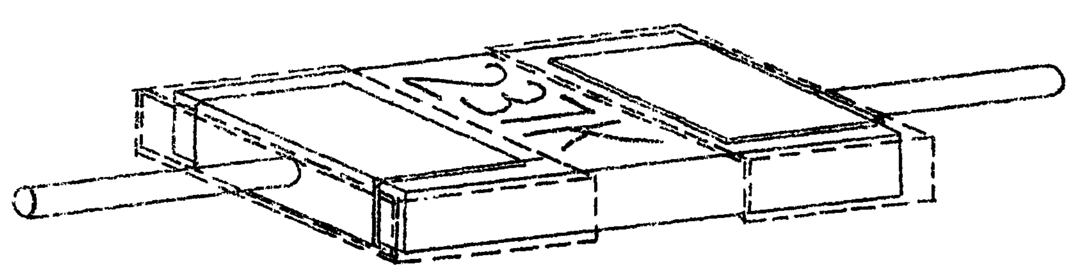
The use of cold setting inorganic cements was tried (Quarterly Report No. 6) but was found to be unsuccessful although the manufacturers of these cements reported them to be unaffected by water. We were unable to find a single cold setting cement in this class that was not completely soluable in water in a relatively short period of time. Also, the tensile strength of these cements was very low and would not provide enough assurance that the leads would not twist open the sandwich in actual use. This method was abandoned after several trials.

Finally it was decided to use an epoxy resin (Quarterly Report No. 7) and this approach was used in the first pre-production tests of Item 7. These pre-production tests were partially successful. Problems developed because of moisture that was able to penetrate the thin layer of frit which produced losses in polarization.

Problems also occurred in humidity testing when water was absorbed in the hairline openings of the frit. This water remained for many hours and sometimes for a few days before it completely evaporated. This presented no problem in low value resistors but in values above 200,000 ohms it presented a much lower value due to moisture. This lowering of the value or shorting out of the resistor due to entrapped moisture was enough to bring the value out of tolerance.

Various modifications of the sandwich construction were tried (Quarterly Report No. 8, 11 and 12) to make it workable with the Corning Glass but none were completely successful. Finally in an effort to overcome these problems the sandwich application was put aside and a single glass was used since experience has demonstrated that one of the major problems was the trapping of moisture in areas not completely exposed to atmosphere. These areas occurred in the fine pinholes and cracks in a single layer of frit hidden from the atmosphere because of the narrow space between the sandwich.

In the single piece of glass resin was used on top of the frit to attempt to pass the polarization test (Quarterly Report No. 14). Pre-production runs were made with this construction but ran into several problems, mainly in polarization because of the inadequacies of resin insulation over the thin layer of frit. Experiments were made with many kinds of resin to try to protect the single layer of frit. The best resins were found to be silicone but unfortunately these resins were so brittle that on temperature cycling cracks would develop and the resistance film would become exposed. (Quarterly Report No. 15 and No. 16) However, sufficient pre-production testing was run using this construction to substantially prove out the qualities of the resistor film. The final construction (Quarterly Report No. 17 to No. 23) that has been successful and has passed all of the pilot run tests is as illustrated.



RESISTOR CONSTRUCTION

Due to the obtaining of proper glass for the resistor, certain construction features were able to be used that were not possible with the previous base glass. The final construction is a unit that is composed of a glass plate with two "U" shaped leads attached to the short ends and insulation limited to the metal caps. The preceding sketch illustrates the resistor with the insulation in shaded pattern in order to more clearly show the cap construction.

This construction is identical for all wattage sizes from the 1/8 Watt to the 1 Watt. The method of manufacture is identical for all wattage sizes until the final cutting of the glass sheet. All values are made on the same size sheet which at the present time is 8" x 10" x .060 thick. The 1/2 Watt size of 1/4" x 1/2" has 504 resistors and the 1/8 Watt size which is 1/8" x 1/4" has 2016 resistors on a sheet. Different sizes of resistance values are processed by identical steps merely using different photographic images. When the sheets are finished they are then cut into their respective sizes and capped.

The detailed steps of the resistor image pattern and the various printing patterns used for the resistor are given in Quarterly Report No. 17. The construction is made possible by the use of a different substrate glass that is high enough in expansion to permit using more available frits. The frit thickness is .004 and is obtained by four separately fired coats. The caps are directly over the frit but because of the seal this presents no problem. This construction solves all of the previous problems that were encountered except for the insulation over the resistor caps.

The insulating shrinkable sleeves that were used during the pilot run are not completely satisfactory. Because of the shifting of the sleeves during shrinkage they cannot be accurately placed over the cap and in a certain percentage of units the sleeves must be replaced since they do not adequately cover the metal cap. Other methods of insulating the cap were investigated such as powder resin coatings, but no funds were available for incorporating this type of equipment into the final operations.

NO. 2 GLASS BASE

When the contract was negotiated with the Signal Corps it was thought that the only problem that was solved was the glass base problem. As it turned out, it was the only problem that was not solved. It was not until five years after the contract award that a glass base of proper qualities was available for resistors. If this base were available at the start the entire contract would have been finished in eighteen months instead of six years.

Due to the difficulties involved trying to find a frit to match the base glass, a glass coating machine was proposed (Quarterly Report No. 2). This equipment would be designed to flow a thin coat of proper electrical glass onto a window glass base. The electrical glass coating would be of proper volume resistivity and coefficient of expansion to cooperate with available frits of adequate properties. Since no funding was available at this time (Quarterly Report No. 6) it was attempted to try some alternate methods to achieve a proper electrical surface. One line of experimentation was of depositing a non-conductive coating of approximately one micron of iridized film. These films permitted load life performance in the order of two or three times better than window glass but the best results were still short of what was possible with a proper electrical glass surface. Also, a problem in the thin iridized film was the eventual breakdown through the film after which the resistor would perform no better than with a window glass substrate.

Another method tried was that of printing frit with proper electrical properties over window glass in attempting to fuse the frit at high temperatures. (Quarterly Report No. 7). This approach was only partially successful because it was found that even at temperatures so high the base glass warped beyond usability, the frit did not flow sufficiently to provide a proper surface for fine detail. Apparently entrapments of infusable material in the frit, either because of the small particle size or chemical change due to the small particle size, prevented a continuous surface from forming. This method was put aside.

Funding became available for evaluating the flowing of a thin glass film onto a window glass substrate. A miniature melting tank was set up which consisted of a crucible to hold about two pounds of molten glass with an orifice and a conveyor on which the glass moved at a constant speed over the orifice. The conveyor was heated to bring the glass sheet above the strain point (Quarterly Report No. 8) and a platinum rod was used as a doctor blade to accurately provide a proper thickness for the molten glass.

Small samples were made and resistor films were tried upon these. It was discovered that sodium migration would penetrate under conditions of usage through the thin layers of electrically adequate glass. Apparently a thick layer of glass would be required for this application and since this was beyond the range of the equipment and funding that was available, it was decided to try to find a source that would make the electrical glass in sheets.

We were unable to purchase proper glass from Corning at this time and made arrangements with Bausch & Lomb Optical Company for a run of glass which was unsuccessful, and a later run was arranged with Hayward Glass Company which was also unsuccessful. Each run consisted of 1,000 to 2,000 pounds of glass that was cast into a large slab and then sawed into slices and ground and polished to a proper thickness.

The problems of grinding and polishing large sheets of glass proved to be very difficult and our yield was so low that it became apparent that this was not a practical method for us. The only practical method was to make the glass sheet by direct drawing so that no grinding or polishing would be necessary.

We finally decided to attempt to make our own glass drawing equipment. The design was started early 1960. Successful glass was not made until May of 1961. The new base glass has proven out very well and has answered all of the requirements that we have previously specified. Control of coefficient of expansion and volume resistivity, two of the important problems, are very readily maintained to close limits. Other controls as flatness, thickness, tolerance, and other physical specifications are maintained much closer than the glass received from Corning Glass Company and this has simplified the later processing very considerably. The glass facility has a production capability large enough for all of the substrates that we will require for the next few years.

NO. 3 GLASS FRIT PROBLEM

In a previous statement we have said that our main problem in completing the contract on time was a glass base problem. This is not completely accurate. If we had found a frit to match the Corning Glass that had previously been purchased for the contract there would have been no glass base problem.

Corning Glass Company attempted to supply us with a matching frit for the glass for almost a year until they had nothing further to offer us. We then contacted all of the major frit manufacturers in this country and abroad in an effort to buy either a commercial or made to order frit to fuse upon the Corning glass.

After several months of trying the many, many, varities of frit that were sent to us by these manufacturers we were forced to conclude that we had not yet found any frit that would work, and in addition there were no commercial prospects left to try of which we were aware.

It was decided to set up our own frit making facility and attempt to develop a frit ourselves. Such a facility was organized (Quarterly Report No. 7) and was completely equipped with physical and electrical measurements for proper selection of the glass frit. Literature and patents were combed for prior work in this field. Many experiments were performed and finally after almost two years a family of glass frits were developed that did not match the Corning glass but were able to be fired on in very thin coatings with little enough strain so that it was possible to at least run pre-production tests with resistors.

We gave up the search for a frit with low enough expansion and low enough softening point to fit the Corning glass. The only way out we had decided was to find a higher expansion glass. This would bring into range several frits that were commercially available or that we had formulated.

After our base glass had been made in our own facility we were able to find a suitable frit with the proper matching characteristics for the glass. It was thought that it might be better to have the frit made by a commercial manufacturer but when the specifications of manufacture were submitted to us by the commercial manufacturers we decided that their limits of purity were not adequate to meet the best electrical requirements. We therefore decided to manufacture our own frit so that the purity and maximum electrical properties could be maintained.

We have at our own expense a frit making facility that can melt a thousand pounds of frit in one firing. This facility is adequate for all of our forseeable needs.

NO. 4 METHODS OF IMPROVING FILM EVENNESS BY SPRAYING TECHNIQUES.

This did not loom as a serious problem at any time but a certain amount of work was done on this, mostly by way of modifications of spray technique. An electrostatic spray field was set up whereby the glass was set at ground potential and the spray gun was operated at D. C. voltages of 75,000 to 150,000 volts. The spray ejected from the gun was charged with approximately the same voltage as the gun and was attracted to the glass because of the potential difference. This technique resulted in a slight improvement in evenness but not enough to justify the extra hazard of the high voltage in the spray cabinet.

It was thought that multiple spray sources might give a better distribution of fluid upon the substrate. Multiple headed guns were tried but were not completely successful. Problems such as intermingling of field edges, interferance of spray patterns from adjoining nozzles, less predictable spray patterns, and general lessening of control resulted from the multiple head nozzles. It was also found that fine atomization was more difficult to achieve with these heads. (Quarterly Report No. 6)

The possibility was explored of modifying the spray pattern with external air jets. The internal air jets of the spray nozzles were disconnected and they were replaced by large external jets. A few experiments indicated that the volume of air required for control with the jets removed from the spray, made it almost impractical in trying to gain close control of the spray. Therefore this approach was abandoned after a few trials.

Another approach similar to this method was attempted (Quarterly Report No. 7) to provide the air used to modify the spray system was provided by modified loud speakers. The speakers generated a pulsated type of air current that it seemed would make control simple because the pulses could be controlled electrically. This method presented promising possibilities except that the proper volume of air would have required a tremendous speaking system and its very size would make it impractical to use in the spray booth.

The system that we have found the best success with has been a single headed reciprocating spray gun. This gun gives us uniformity of ±8% over the entire sheet which we feel is adequate for our present needs.

The following are the full time engineers and technicians who worked on the project in its closing period.

Bernard Feldman	-	Electrical Engineer
Grace Murray	-	Technician
Dan Nogavich	-	Technician
Ed Podwojski	-	Mechanical Engineer
Nathan Pritikin	-	Supervisor
Andres Romero	-	Technician
Wendell Ross	-	Technician
William Ross	-	Technician
Ivan Sarda	-	Technician
Tom Sommers	-	Electrical Engineer
Daryl Sprague	-	Technician

SCHEDULE A EQUIPMENT

ITEM 1 & 2 **RESISTOR COATING EQUIPMENT INCLUDING LECTRODRYER**

This includes the largest grouping of component units. The proper deposition of tin oxide films onto a substrate requires exact control at every point.

The following five photographs illustrate the major operations and controls.

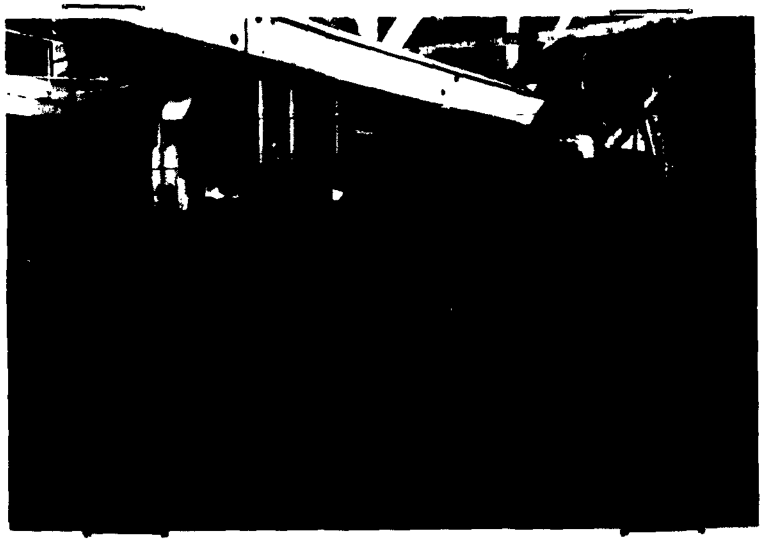


PHOTO NO. 1

Photo No. 1 is a view from the back of the entire operation. The Lectrodryer is on the extreme left of the spray booth in the center behind the conveyor structure, and the furnace is behind the spray booth and cannot be seen from this point. The conditions in the spray booth prior to spraying the solutions onto the hot glass must be held very closely as far as temperature, humidity, and velocity of air movement.

A large duct controls the air flow from the Lectrodryer to the booth. The duct is seen in the photo as an inverted "U" and has a cross sectional area of three cubic feet. In this way large volumes of air at low velocity are able to be pumped into the booth. The Lectrodryer maintains the air at an exact humidity and temperature and provides all of the air into the booth. All other inlets to the booth are sealed except the slots that provide the entrance and exit for the conveyor racks. However, no outside air can come in through these areas because of the positive pressure maintained by the Lectrodryer.

The spray booth is compartmentalized and baffled to permit proper control of convection currents. Maximum uniformity of temperature and minimum of cooling of the hot glass is maintained as it leaves the furnace and arrives into the booth for spraying.

The Lectrodryer exhausts its conditioned air into a chamber comprising approximately 1/8th the total volume of the spray booth. This chamber acts as an intermediate storage area where the new air mixes with residual air of the booth and through various openings pours into the spray booth proper but at a lower velocity than entering into the first compartment. The conditioned air slowly moves toward the conveyor. Immediately in back of the conveyor is a large baffle that is designed to prevent unequal air currents resulting from the intake to the exhaust fan, which exhaust passage is seen on the right side of the photo. It will be noted that the exhaust duct is very large to permit a high volume but low velocity removal of air from the booth.

The conveyor chain operates above and outside of the booth. Hangers at spaced locations are fastened to the conveyor chain by stainless steel bars. The bars permit a small slot approximately 1/2" wide to handle the moving racks through the furnace and the booth.

The conveyor operates under a constant tension to provide for compensation to expansion and contraction due to part of the conveyor being constantly heated when it is under the furnace. Since the total conveyor chain is approximately 50 feet long, changes in its length of 1/2" to 1" are constantly occurring and are continuously accomodated by the constant adjusting spring loaded conveyor structure.

The conveyor chain is of a stainless steel composition to prevent scaling that would interfere with the cleanliness of the glass surface necessary for proper film deposition. The chain drive operates at approximately one foot per second and has an instant clutch and brake arrangement. This makes it possible for the furnace doors, which are air operated, to carry the glass into the furnace and the doors to close in the matter of two seconds. The fast transfer of the glass into the furnace permits the furnace ambient to be held very closely and the heat pattern to be maintained so that equilibrium is restored within a matter of seconds after the door is closed.

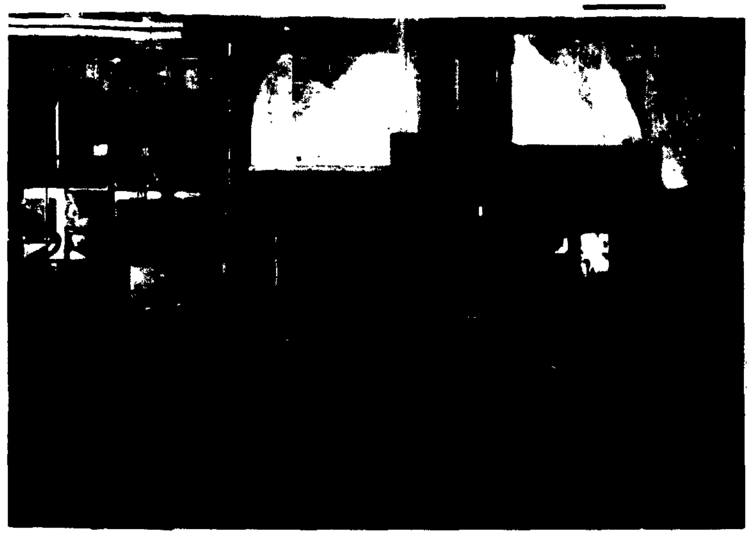


PHOTO NO. 2

Photo No. 2 illustrates more closely the relations of the duct from the Electrodryer to the first compartment of the booth. On the left side of the photo the backs of the installation to control temperature and cycle in the furnace can be seen.

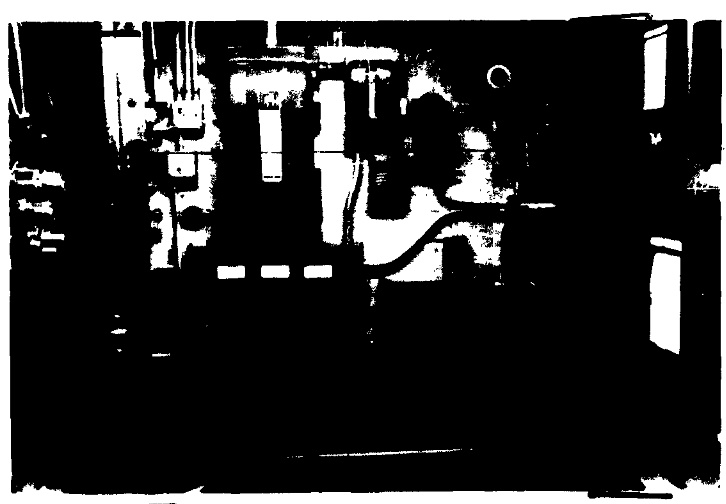


PHOTO NO. 3

Photo No. 3. Part of the control panel is shown. On the left of the panel is the main switch for the heating elements and the ammeters which indicate the balance achieved on each phase of the three phase load.

The timer in the upper right hand corner controls precisely the period of solution spray onto the glass in the booth. Solution spraying time is limited to ten seconds. Any interval longer than this has been found to cool the glass to a stage that change the electrical properties.

The cabinet on the stand on the right side of the photograph is a four station recorder whose input is fed from four fixed Ray-O-Tubes. Their function is to constantly monitor the temperature of the glass directly in line sight of the tubes as the glass heats in the furnace.

The fifth and center tube that can be seen more closely in Photo No. 4 directly controls the instrument on the extreme right of Photo No. 3. This instrument operates at a pre-set temperature which when reached and indicated by the center Ray-O-Tube automatically opens furnace doors, activates the conveyor to move the glass into the booth where other timing equipment automatically starts the spray apparatus for its pre-determined period.

PHOTO NO. 4

Photo No. 4 provides a closer look at the furnace showing the air operated left door, the five Ray-O-Tubes in the center of the furnace and part of the variable transformers on the lower part of the furnace.

Technician places glass substrate sheet in holder prior to heating it in controlled electric furnace where thin film deposition by thermal decomposition will take place. Furnace operator adjusts automatic temperature and time cycling controls

PHOTO NO. 5

Photo No. 5 illustrates the operation of the conveyor and furnace. The Ray-O-Tubes are seen immediately at the left of the operator. The center position of the furnace heating elements is composed of nine 6" x 6" individual heating plates making a 18"x18" surface. These heating surfaces are arranged in two parallel walls facing each other separated by approximately 12", the center of which the glass travels through. The heating walls have separate elements on the upper one-third, the bottom one-third, and the left and right sides, which give the operator four general zones and nine spot zones of control on each side of the furnace.

Since the glass to be heated is approximately 12" x 14" very exact control of the heat pattern onto the glass is possible. The exact temperature of different areas of the glass sheet is very important at this stage because of the necessity to compensate for the uneven cooling pattern experienced when the glass enters booth temperature air prior to spraying.

Further unevenness in temperature due to cooling during spraying must be compensated for during the heating cycle; especially since the spray cooling is quite complex, depending upon different rates of radiation from corners to sides to the center of the glass.

The temperature pattern of the glass while in the furnace must be controlled to compensate for these later changes. With these controls we are able to maintain resistance of a large sheet of glass to better than ±8% over the entire sheet. Better control of resistance is possible with the present control system although we have not tried to achieve less variation at this time.

The calibrating method that is used to finally produce ±1% resistors is able to produce a 1% resistor with a ±8% variation through the sheet.

The glass sheet after it is sprayed and the tin oxide film has been formed, stays on the conveyor holder until the holder returns to an initial position which can be seen in Photo No. 5 as the technician on the left has removed the glass and is replacing it with a glass to be processed.

ITEM 3 PHOTO IMAGE APPARATUS

After glasses have been processed with tin oxide coatings, a photographic image is printed onto the oxide coat. This is done with conventional photo resist equipment such as illustrated in Photo No. 6.

PHOTO NO. 6

The photo resist is whirled onto the glass sheet to dry it and then placed into a fixture which is part of a vacuum printing frame. This fixture locates the glass sheet in relationship to the image pattern on a glass negative. The location is important since many subsequent operations are performed which must be held to very close registration.

The glass is exposed before a conventional arc lamp which fixes the image upon the photographic surface and with other conventional operations the photographic pattern is developed and dried. The oxide coat is etched and this provides the proper number of squares for the particular value that is required.

In the previous quarterly report the configuration design is detailed along with the several printing operations on the glass sheet.

ITEM 4 **SURFACE COMBUSTION LEHR**

The lehr or conveyor tunnel furnace is one of the important pieces of equipment in order to obtain reproducibility between resistor sheets. The lehr is illustrated in Photo No. 7 looking at the exit end. The conveyor belt and belt speed adjustment mechanism are at the extreme right.

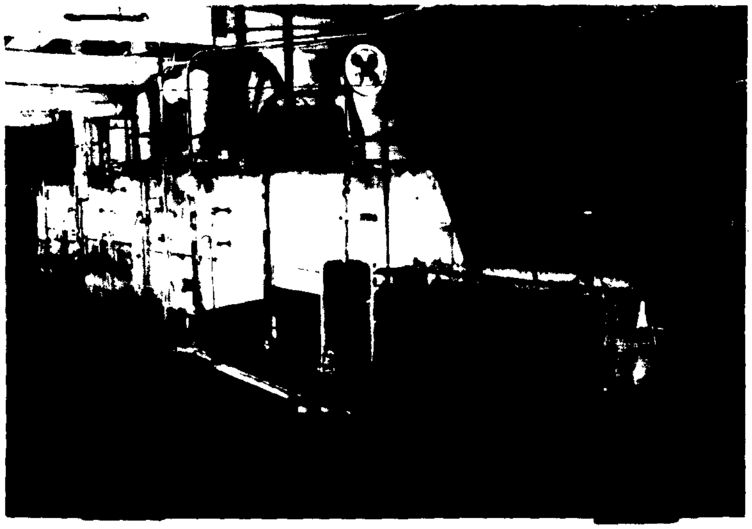


PHOTO NO. 7

The lehr is approximately 50 feet long and is divided into several zones of temperature gradient. The first zone starts at approximately 500°F. Glasses are fed into this zone and the temperature is maintained on a gradually rising slope for about ten minutes. During this time materials such as solvents and oils used in the printing paste are volatized. As the temperature rises to 700°F - 800°F binders as ethyl cellulose used to hold the screening paste together are burned away and at 900°F all organic material disappears from the printed layers.

The temperature continues to rise as the conveyor belt brings the glass closer to the hottest controlled zone. This zone is set at a range from 1100°F to 1200°F depending on the nature of the material being fused to the glass. Whatever the temperature range selected the temperature is held to ± 1°C. In the maximum temperature zone a high velocity blower helps maintain the constant temperature through the use of baffles and directional exits in the brickwork.

The heating elements in the lehr are gas fired stainless steel tubes. These tubes are approximately 4" in diameter and twist under and over the heating chamber and eventually emerge through the top and feed into a central exhaust system. In this way only the outside surface of the tube provides the input of heat into the lehr chamber. The gas flames that heat the tube are all contained on the inside of the tube and their exhaust products are gathered by the central exhaust system which can be seen on the top of the lehr in Photo No. 7. In this way products of combustion of the fuel never see the glass surface and reactions by the combustion products and the glass surface and pastes cannot occur.

Thermocouples are placed in several zones on both sides of the lehr and are monitored in a central thermocouple recording station.

Inspector checks sheets of thin film resistors as they emerge from lehr where he
metically sealing glass frit has been fired.

PHOTO NO. 8

In Photo No. 8 the operator on the left is checking the temperature of the wall in the hot critical zone through a special door built for this purpose. This provides us with a direct check upon the thermocouple system that is used to control the temperature of the lehr. The operator on the right is inspecting glasses that have been fired and sealed with glass frit.

ITEM 8 **SILK SCREEN MACHINE**

This equipment has been illustrated in previous reports but Photo No. 9 is a close-up showing the metal mesh screens and the registration plate used for printing terminals, insulation, frits, and other printing operations onto the resistor glass.

Operator performs printing of silver terminal connections on a sheet of [illegible] resistors.

PHOTO NO. 9

In the previous quarterly report details on the printing operations were given showing each pattern and the type of material printed upon resistor glasses.

The registration system as seen on the table consists of three guide positions. These are the same guide positions that were used in the photo resist process and that are used in the calibrating and cutting operations. This guide system permits the location of any part of the image on the glass to be located on the various equipments with a maximum error of ±.005.

ITEM 5 GLASS CUTTING MACHINE

This machine scores the glass sheet and permits the breaking of individual resistors into a pre-determined size. In Photo No. 10 a general view of the machine is seen.

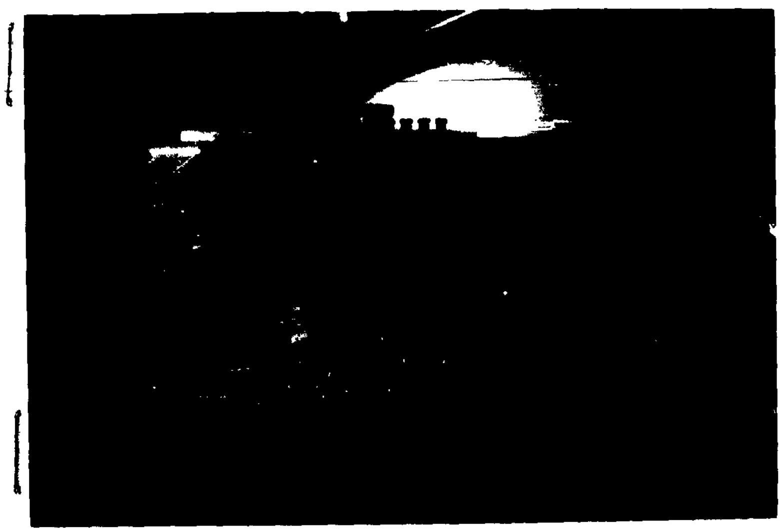


PHOTO NO. 10

The carriage has provision for multiple cutting wheels and the entire head moves from front to back. Spring pressure is maintained individually on each cutting wheel against the glass sheet. The glass sheet is held firmly as shown in Photo No. 11 against three guide positions onto a vacuum table.

Sheets of resistor elements are scored and divided into individual elements.

PHOTO NO. 11

The vacuum table holds the glass firmly as the glass is scored. After a single pass is made the handle illustrated in Photo No. 10 on the right front side of the machine is depressed and the entire table then is manually moved 90° from its original position. A second pass of the head is then made and the glass is now removed, ready for breaking into individual pieces.

The cutter separations are nominally set at 1/2" centers. For 1/4" x 1/2" resistors the 1/4" score must be made in two passes. This is accomplished by moving the lever illustrated in Photo No. 10 on the extreme left hand side. The lever moves the table from left to right in the increments of 1/16 of an inch. This makes it possible to score glasses with dimensions of 1/8" x 1/4" and 1/4" x 1/2" and 1/4" x 1" with the same standard head. After the cutting operation, glasses are broken and are assembled.

ITEM 6 **CALIBRATING MACHINE**

The calibrating machine was illustrated with photographs and explained in detail in the previous report. The resistors are calibrated to ±1% while they are in sheet form. This permits precise registration of the adjustment areas so that the sheets may be calibrated automatically without registration problems.

ITEM 30 **GLASS CONTROL EQUIPMENT**

The various items that make up this group have been illustrated previously and a discussion on how frit is made and controlled, including photographs of the equipment, is contained in Quarterly Report No. 7.

The other items are all standard equipments and essentially shelf items.

ANALYSIS OF PILOT RUNS - ITEMS NO. 1, 2, 3, 4, 5, 6, AND 12.

On the whole the tests ran smoothly and there were few problems. The main problem was that of insulating the resistor caps with the mylar sleeves that we had decided to use for this run. The length of the sleeves was not uniform and the degree of shrinkage was not the same. This provided a problem in the Group III test where many of the sleeves had to be removed and replaced because of permitting bare spots in the cap to be exposed. This would cause polarization failures and failures in the reduced pressure dielectric test.

In order to protect the Style RN 60 properly it was found that the identification on the resistor had to be almost completely covered. Because of this, separate identification tags were made and attached to a lead of each resistor. For the other sizes the identification on the resistor body were still accessible and could be used.

In Group III tests considerable leakage was experienced in the high humidity readings. In one case a 301 K resistor registered a .6% difference between the high humidity for subsequent ambient reading (Resistor No. 15).

Group IV tests ran into some problems on the +65°C reading for temperature coefficient. RN 65 Resistor No. 24 of 49.9 Ohms was out of tolerance. However, when this resistor was read after load life it was found to be in tolerance and in agreement with all the other temperatures at which the temperature coefficient test were taken.

Style RN 75 in Group IV tests of 2 Megohm value Resistor No. 23 was out of tolerance in the +65°C and 175°C readings. This resistor was discovered in the first few hours of load life testing to be erratic and the load life oven was opened under the supervision of the Quality Assurance Inspector. He found that Resistor No. 23 was connected loosely to the terminal, apparently because of a cold solder joint. He permitted this resistor to be resoldered to the terminal and it passed load life testing. After the load life test a new temperature coefficient was taken and the results of +7 parts per million was found to agree with the initial readings of -15°C and -55°C test. Our theory is that the connection became intermittent between the -55°C and +55°C point and remained intermittent until the defective joint was discovered in the load life test. However, this resistor is classified as being out of tolerance.

Load life tests for Style RN 60, 200 K, ran into a problem on the 750 hour reading. Sometime between the 500 and 750 hour reading the regulated power supply lost its regulation and the voltage went out of control and was observed to be at 350 Volts +. Since the voltages were checked daily this condition could not have existed for more than 24 hours. However, since the proper voltage should have been 158 Volts, at least five times wattage was impressed upon these units for this time. As a consequence the 750 hour reading is somewhat out of step from the normal pattern of load life changes.

In Group IV testing, both the shock and high frequency vibration were performed outside our plant. The Quality Assurance Inspector permitted us to bypass resistance readings after shock and make only a final resistance reading after high frequency vibration.

In Style RN 75, 2 Megohm, Resistor No. 39 was broken during connection to the vibration fixture. It was shorted out and the test was run with it in place.

MIL R-10509-D **RESISTOR QUALIFICATION INSPECTION** GROUP I

DEFECTS ALLOWED 0 **METHOD PARAGRAPH:** 4 61, 4.6.2

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C **DATE** 27 AUG 62

STYLE RN 60

RES NO	VISUAL & MECHANICAL METHOD PARAGRAPH 4 6 1 LEAD LENGTH 1.5 ±.125	RES LENGTH GLASS .250	RES WIDTH GLASS .125	RES THICK .125 MAX	MARKING	INITIAL D.C RESISTANCE METH. PAR 4 6 2	REMARKS
1	O.K.	O.K.	O.K.	O.K.	GOOD	49.553	
2						49.925	
3						50.005	
4						50.083	
5						50.087	
6						49.909	
7						49.919	
8						49.889	
9						49.699	
10						49.937	
11						49.726	
12						50.164	
13						50.122	
14						49.713	
15						50.046	
16						50.225	
17						49.728	
18						50.033	
19						50.140	
20						49.844	
21						50.010	
22						49.885	
23						49.703	
24						49.763	
25						49.946	
26						49.850	
27						49.803	
28						50.103	
29						50.022	
30						49.650	
31						49.807	
32						49.620	
33						49.870	
34						50.240	
35						50.190	
36						49.574	
37						49.821	
38						49.606	
39						50.042	
40						50.198	

[illegible] [illegible]

MIL R-10509-D RESISTOR QUALIFICATION INSPECTION GROUP I

DEFECTS ALLOWED 0 METHOD PARAGRAPH: 4.61, 4.6.2

NOMINAL RESISTANCE 200K Ω

CHARACTERISTIC C DATE 27 Aug 62

STYLE RN 60

RES. NO.	VISUAL & MECHANICAL METHOD PARAGRAPH 4.6.1					INITIAL D.C. RESISTANCE METH. PAR. 4.6.2	REMARKS
	LEAD LENGTH 1.5±.125	RES. LENGTH GLASS .250	RES. WIDTH GLAS .125	RES. THICK .125 MAX	MARKING		
1	O.K.	O.K.	O.K.	O.K.	GOOD	199.21	
2						200.95	
3						200.74	
4						200.67	
5						200.25	
6						199.84	
7						200.58	
8						200.06	
9						199.73	
10						201.67	
11						199.06	
12						199.14	
13						199.46	
14						200.94	
15						199.92	
16						200.06	
17						200.95	
18						198.57	
19						201.18	
20						199.25	
21						200.62	
22						200.27	
23						200.44	
24						200.41	
25						200.00	
26						199.62	
27						200.94	
28						199.29	
29						199.00	
30						199.61	
31						198.79	
32						200.09	
33						199.91	
34						201.21	
35						199.83	
36						200.30	
37						199.50	
38						199.20	
39						199.47	
40						201.84	

Nathan Putikin - Eng

[illegible] 10-10-62

MIL R-10509-D **RESISTOR QUALIFICATION INSPECTION** GROUP I

DEFECTS ALLOWED 0 METHOD PARAGRAPH: 4.61, 4.6.2

NOMINAL RESISTANCE 301 K Ω

CHARACTERISTIC C DATE 27 AUG 62

STYLE RN 60

RES. NO.	VISUAL & MECHANICAL METHOD PARAGRAPH 4.6.1					INITIAL D.C. RESISTANCE METH. PAR. 4.6.2	REMARKS
	LEAD LENGTH 1.5 ± .125	RES. LENGTH CLASS .250	RES. WIDTH CLASS .125	RES. THICK .125 MAX	MARKING		
1	O.K.	O.K.	O.K.	O.K.	GOOD	300.84	
2						302.05	
3						298.87	
4						298.87	
5						300.23	
6						299.46	
7						301.39	
8						300.11	
9						300.36	
10						301.23	
[illegible]						299.08	
[illegible]						298.78	
13						300.27	
14						300.37	
15						300.39	
16						299.63	
17						301.71	
18						299.44	
19						301.45	
20						300.02	
21						299.76	
22						300.19	
23						299.47	
24						299.80	
25						298.99	
26						299.28	
27						300.51	
28						303.21	
29						300.36	
30						300.31	
31						300.23	
32						299.71	
33						302.51	
34						299.61	
35						299.45	
36						299.74	
37						300.21	
38						299.79	
39						301.59	
40						298.99	

[illegible]

[illegible]

MIL R-10509-D **RESISTOR QUALIFICATION INSPECTION** **GROUP I**

DEFECTS ALLOWED 0 **METHOD PARAGRAPH: 4.61, 4.6.2**

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C **DATE** 27 AUG 62

STYLE RN 65

RES NO	VISUAL & MECHANICAL METHOD PARAGRAPH 4 6.1 LEAD LENGTH 1.5±.125	RES LENGTH GLASS .375	RES WIDTH GLASS .187	RES THICK .125 MAX	MARKING	INITIAL D.C. RESISTANCE METH PAR 4 6 2	REMARKS
1	O.K.	O.K.	O.K.	O.K.	GOOD	49.708	
2						50.096	
3						49.590	
4						49.934	
5						49.812	
6						49.960	
7						49.525	
8						49.522	
9						50.050	
10						49.720	
11						50.043	
12						49.633	
13						50.110	
14						49.998	
15						50.192	
16						49.920	
17						49.545	
18						49.567	
19						50.310	
20						49.709	
21						49.612	
22						49.762	
23						50.100	
24						50.070	
25						49.983	
26						49.817	
27						49.926	
28						49.745	
29						49.791	
30						49.613	
31						49.708	
32						49.719	
33						49.960	
34						49.636	
35						49.712	
36						50.277	
37						49.824	
38						49.880	
39						50.040	
40						49.760	

[illegible] – Eng. [illegible] USAERA 10-10-62

MIL R-10509-D **RESISTOR QUALIFICATION INSPECTION** **GROUP I**

DEFECTS ALLOWED 0 **METHOD PARAGRAPH:** 4 61, 4 6 2

NOMINAL RESISTANCE 348 K Ω

CHARACTERISTIC C **DATE** 27 Aug 62

STYLE RN 65

RES NO	VISUAL & MECHANICAL METHOD PARAGRAPH 4 6 1 — LEAD LENGTH 1.5 ± .05	RES LENGTH GLASS .375	RES WIDTH GLASS .187	RES THICK .125 MAX	MARKING	INITIAL D.C RESISTANCE METH PAR 4 6 2	REMARKS
1	OK	OK	OK	OK	Good	348.21	
2						347.79	
3						345.92	
4						348.21	
5						347.19	
6						347.77	
7						347.38	
8						350.43	
9						348.95	
10						348.56	
11						346.61	
12						348.91	
13						347.22	
14						347.25	
15						348.36	
16						348.35	
17						347.14	
18						347.05	
19						349.13	
20						348.51	
21						348.91	
22						348.61	
23						346.95	
24						347.73	
25						347.55	
26						348.03	
27						348.75	
28						348.26	
29						348.65	
30						349.29	
31						349.79	
32						345.67	
33						350.38	
34						350.06	
35						349.09	
36						349.32	
37						348.46	
38						348.63	
39						346.72	
40						349.51	

Nathan Patton - Test Eng

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MIL R-10509-D | RESISTOR QUALIFICATION INSPECTION | GROUP I

DEFECTS ALLOWED 0 METHOD PARAGRAPH: 4.61, 4.6.2

NOMINAL RESISTANCE 499K Ω

CHARACTERISTIC C DATE 27 Aug 62

STYLE RN 65

RES. NO.	VISUAL & MECHANICAL METHOD PARAGRAPH 4.6.1					INITIAL D.C. RESISTANCE METH. PAR. 4.6.2	REMARKS
	LEAD LENGTH 1.5±.125	RES. LENGTH GLAS .375	RES. WIDTH GLAS [illegible]	RES. THICK .125 MAX	MARKING		
1	O.K.	O.K.	O.K.	O.K.	GOOD	497.48	
2						501.97	
3						498.52	
4						500.09	
5						495.51	
6						500.09	
7						497.46	
8						499.11	
9						497.25	
10						497.22	
11						499.14	
12						499.71	
13						500.01	
14						500.46	
15						501.12	
16						500.31	
17						497.59	
18						501.21	
19						500.19	
20						500.81	
21						498.29	
22						496.75	
23						495.79	
24						502.25	
25						500.41	
26						499.71	
27						499.61	
28						500.57	
29						497.61	
30						500.21	
31						499.01	
32						497.09	
33						499.40	
34						497.35	
35						495.69	
36						495.62	
37						500.02	
38						499.51	
39						495.74	
40						501.96	

[illegible] -Eng. [illegible] USAF

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MIL R-10509-D — RESISTOR QUALIFICATION INSPECTION — GROUP I

DEFECTS ALLOWED 0 METHOD PARAGRAPH 4 61, 4 6 2

NOMINAL RESISTANCE 2 MΩ

CHARACTERISTIC C DATE 27 AUG 62

STYLE RN 75

RES. NO	VISUAL & MECHANICAL METHOD PARAGRAPH 4 6 1					INITIAL D.C. RESISTANCE METH. PAR 4 6 2	REMARKS
	LEAD LENGTH 1.5 ±.125	RES LENGTH .9455-.500	RES WIDTH .6155-.20	RES THICK .125 MAX	MARKING		
1	O.K.	O.K.	O.K.	O.K.	GOOD	1.9911	
2						1.9891	
3						2.0113	
4						1.9944	
5						1.9936	
6						1.9924	
7						2.0020	
8						2.0061	
9						1.9981	
10						2.0045	
11						1.9965	
12						1.9905	
13						1.9900	
14						1.9887	
15						1.9938	
16						1.9907	
17						2.0057	
18						1.9951	
19						1.9925	
20						1.9851	
21						2.0011	
22						1.9887	
23						1.9962	
24						1.9885	
25						2.0061	
26						2.0082	
27						1.9956	
28						2.0023	
29						2.0096	
30						2.0071	
31						2.0021	
32						2.0004	
33						2.0097	
34						2.0058	
35						2.0033	
36						1.9961	
37						1.9941	
38						2.0054	
39						2.0151	
40						1.9974	

Nathan Pittman - Eng.

Noel Attrucker Qlty U.S.AENA
10-10-62

MIL R-10509-D　　　　RESISTOR QUALIFICATION TESTS　　　　GROUP II

DEFECTS ALLOWED 1　　　　METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C　　　　DATE 29 Aug 62

STYLE RN 60

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4			-65°C OPERATION METHOD PAR. 4.6.5		SHORT TIME OVERLOAD METHOD PAR. 4.6.6	
		INITIAL D.C. RES.	FINAL D.C. RES	% CHG. ±(.25% +.05)	FINAL D.C. RESIST	% CHG. ±(.25% +.05)	FINAL D.C. RESIST.	% CHG. ±(.25% +.05)
	1	49.553	49.512	-.08	49.505	-.016	49.510	+.01
	2	49.925	49.923	+.01	49.874	-.098	49.885	+.02
	3	50.005	50.033	+.06	50.028	-.010	49.987	-.08
	4	50.083	50.103	+.04	50.055	-.096	49.971	-.17
	5	50.087	50.085	+.01	50.012	-.15	49.976	-.07
	6	49.909	49.821	-.18	49.738	-.17	49.738	0
	7	49.919	49.921	+.01	49.912	-.02	49.879	-.07
	8	49.889	49.901	+.03	49.835	-.13	49.848	+.03
	9	49.699	49.721	+.05	49.684	-.074	49.685	0
	10	49.937	49.940	+.01	49.920	-.04	49.928	+.02

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARAGRAPH 4.6.7				REMARKS
		3# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	
	1	✓	✓	49.517	+.01	
	2	✓	✓	49.922	+.07	
	3	✓	✓	50.000	+.03	
	4	✓	✓	50.020	+.10	
	5	✓	✓	49.985	+.02	
	6	✓	✓	49.801	+.13	
	7	✓	✓	49.908	+.06	
	8	✓	✓	49.823	-.05	
	9	✓	✓	49.690	+.01	
	10	✓	✓	49.945	+.05	

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MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP II

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 200K Ω

CHARACTERISTIC C

DATE 29 Aug 62

STYLE RN 60

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4			-65°C OPERATION METHOD PAR. 4.6.5		SHORT TIME OVERLOAD METHOD PAR. 4.6.6	
		INITIAL D.C. RES.	FINAL D.C. RES.	% CHG. ±(.25% +.05)	FINAL D.C. RESIST	% CHG. ±(.25% +.05)	FINAL D.C. RESIST.	% CHG. ±(.25% +.05)
	1	199.21	199.19	-.01	199.10	-.05	199.09	-.01
	2	200.95	200.86	-.04	200.80	-.03	200.82	+.01
	3	200.74	200.69	-.03	200.60	-.05	200.59	-.01
	4	200.67	200.63	-.02	200.54	-.05	200.52	-.01
	5	200.25	200.11	-.07	200.12	+.01	200.14	+.01
	6	199.84	199.80	-.02	199.73	-.04	199.74	+.01
	7	200.54	200.59	-.01	200.40	-.10	200.43	+.02
	8	200.06	200.00	-.03	199.70	-.15	199.69	-.01
	9	199.73	199.62	-.06	199.67	+.03	199.65	-.01
	10	199.47	201.59	-.04	201.54	-.02	201.54	0

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARAGRAPH 4.6.7				REMARKS
		3# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	
	1	✓	✓	199.19	+.05	
	2	✓	✓	200.92	+.05	
	3	✓	✓	200.75	+.08	
	4	✓	✓	200.63	+.05	
	5	✓	✓	200.29	+.08	
	6	✓	✓	199.82	+.05	
	7	✓	✓	200.73	+.15	
	8	✓	✓	199.79	+.05	
	9	✓	✓	199.79	+.07	
	10	✓	✓	201.63	+.05	

Nathan Putikin-Eng

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MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP II

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 301K Ω

CHARACTERISTIC C DATE 29 AUG 62

STYLE RN 60

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4 INITIAL D.C. RES.	TEMP. CYCLING FINAL D.C. RES	TEMP. CYCLING % CHG. ±(.25% +.05)	-65°C OPERATION METHOD PAR. 4.6.5 FINAL D.C. RESIST	-65°C OPERATION % CHG. ±(.25% +.05)	SHORT TIME OVERLOAD METHOD PAR. 4.6.6 FINAL D.C. RESIST.	SHORT TIME OVERLOAD % CHG. ±(.25% +.05)
	1	300.84	300.65	-.07	300.61	-.01	300.58	-.01
	2	302.05	301.86	-.04	301.80	-.05	301.77	-.01
	3	298.87	298.80	-.03	298.59	-.07	298.54	-.02
	4	298.87	298.80	-.03	298.57	-.08	298.54	-.01
	5	300.23	300.09	-.05	299.85	-.15	299.85	0
	6	299.46	299.39	-.03	298.97	-.14	298.99	+.01
	7	301.39	301.39	0	301.12	-.09	301.10	-.01
	8	300.11	300.05	-.02	299.89	-.05	299.91	+.01
	9	300.36	300.37	0	300.10	-.09	300.09	+.01
	10	301.23	301.27	+.01	301.10	-.06	301.05	-.02

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARAGRAPH 4.6.7 3# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	REMARKS
	1	✓	✓	300.81	+.08	
	2	✓	✓	302.07	+.10	
	3	✓	✓	298.80	+.09	
	4	✓	✓	298.77	+.08	
	5	✓	✓	299.66	+.10	
	6	✓	✓	299.20	+.07	
	7	✓	✓	301.29	+.06	
	8	✓	✓	300.11	+.07	
	9	✓	✓	300.35	+.09	
	10	✓	✓	301.24	+.06	

Nathan Putchen - Eng.

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MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP II

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C DATE 29 AUG 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4			-65°C OPERATION METHOD PAR. 4.6.5		SHORT TIME OVERLOAD METHOD PAR. 4.6.6	
		INITIAL D.C. RES.	FINAL D.C. RES	% CHG. ±(.25% +.05)	FINAL D.C. RESIST	% CHG. ±(.25% +.05)	FINAL D.C. RESIST.	% CHG. ±(.25% +.05)
	1	49.708	49.715	+.02	49.695	-.040	49.662	-.07
	2	50.096	50.098	+.01	50.043	-.110	50.032	-.02
	3	49.590	49.598	+.02	49.547	-.10	49.536	-.02
	4	49.934	49.883	-.10	49.876	-.014	49.862	-.03
	5	49.812	49.793	-.04	49.724	-.14	49.728	+.01
	6	49.960	49.986	+.05	49.965	-.04	49.990	+.05
	7	49.535	49.525	-.02	49.484	-.08	49.505	+.04
	8	49.522	49.510	-.03	49.459	-.10	49.451	-.02
	9	50.050	50.066	+.03	50.001	-.13	50.003	+.01
	10	49.720	49.716	-.01	49.666	-.10	49.685	+.04

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARAGRAPH 4.6.7				REMARKS
		3# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	
	1	✓	✓	49.668	+.01	
	2	✓	✓	50.066	+.07	
	3	✓	✓	49.584	+.10	
	4	✓	✓	49.895	+.07	
	5	✓	✓	49.753	+.05	
	6	✓	✓	49.980	-.02	
	7	✓	✓	49.518	+.03	
	8	✓	✓	49.500	+.10	
	9	✓	✓	50.008	+.01	
	10	✓	✓	49.723	+.08	

Nathan Intention -Eng.

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MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP II

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 348K Ω

CHARACTERISTIC C DATE 29 Aug 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4 INITIAL D.C. RES.	FINAL D.C. RES	% CHG. ±(.25% +.05)	-65°C OPERATION METHOD PAR. 4.6.5 FINAL D.C. RESIST	% CHG. ±(.25% +.05)	SHORT TIME OVERLOAD METHOD PAR. 4.6.6 FINAL D.C. RESIST.	% CHG. ±(.25% +.05)
	1	348.21	348.21	0	348.25	+.01	348.23	-.01
	2	347.79	347.79	0	347.83	+.01	347.89	+.02
	3	345.92	345.93	+.01	345.98	+.02	345.89	-.03
	4	348.21	348.17	-.02	348.25	+.02	348.23	-.01
	5	347.19	347.20	+.01	347.22	+.01	347.20	-.01
	6	347.77	347.75	-.01	347.79	+.01	347.74	-.02
	7	347.38	347.30	-.02	347.26	-.01	347.22	-.01
	8	350.43	350.41	-.01	350.45	+.01	350.41	-.01
	9	348.95	348.94	-.01	349.00	+.02	348.98	0
	10	348.56	348.53	-.01	348.59	+.02	348.59	0

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARABRAPH 4.6.7 3# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	REMARKS
	1	✓	✓	348.37	+.04	
	2	✓	✓	347.91	+.01	
	3	✓	✓	346.04	+.04	
	4	✓	✓	348.33	+.03	
	5	✓	✓	347.31	+.03	
	6	✓	✓	347.92	+.05	
	7	✓	✓	347.30	+.02	
	8	✓	✓	350.40	0	
	9	✓	✓	348.89	-.03	
	10	✓	✓	348.69	+.03	

Nathan Putnam - Eng. [illegible] USAEMA
10-10-62

MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP II

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 499K Ω

CHARACTERISTIC C DATE 29 Aug 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4			-65°C OPERATION METHOD PAR. 4.6.5		SHORT TIME OVERLOAD METHOD PAR. 4.6.6	
		INITIAL D.C. RES.	FINAL D.C. RES	% CHG. ±(.25% +.05)	FINAL D.C. RESIST	% CHG. ±(.25% +.05)	FINAL D.C. RESIST.	% CHG. ±(.25% +.05)
	1	497.48	497.37	-.02	497.49	+.02	497.41	-.02
	2	501.97	501.82	-.03	501.91	+.02	501.89	0
	3	498.53	498.49	-.01	498.50	0	498.49	0
	4	500.09	500.04	-.01	500.02	0	500.01	0
	5	495.51	495.42	-.02	495.59	+.03	495.59	0
	6	500.09	500.00	-.02	499.26	-.15	499.19	-.01
	7	497.46	497.44	-.01	497.49	+.01	497.49	0
	8	499.11	499.53	+.09	499.55	0	499.44	-.02
	9	497.35	497.19	-.03	497.25	+.01	497.29	+.01
	10	497.82	497.73	-.02	497.75	0	497.79	+.01

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARAGRAPH 4.6.7				REMARKS
		3# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	
	1	✓	✓	497.52	+.02	
	2	✓	✓	501.69	-.04	
	3	✓	✓	498.51	0	
	4	✓	✓	500.14	+.03	
	5	✓	✓	495.64	+.01	
	6	✓	✓	499.44	+.05	
	7	✓	✓	497.61	+.02	
	8	✓	✓	499.53	+.02	
	9	✓	✓	497.51	+.04	
	10	✓	✓	497.90	+.02	

Nathan Pritchen -Eng Noel McFadden [illegible] USN[illegible]

10-10-62

MIL R-10509-D — RESISTOR QUALIFICATION TESTS — GROUP II

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.4, 4.6.5, 4.6.7, 4.6.3

NOMINAL RESISTANCE 2 M Ω

CHARACTERISTIC C

DATE 29 Aug 62

STYLE RN 75

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METHOD PARAGRAPH 4.6.4			-65°C OPERATION METHOD PAR. 4.6.5		SHORT TIME OVERLOAD METHOD PAR. 4.6.6	
		INITIAL D.C. RES.	FINAL D.C. RES	% CHG. ±(.25% +.05)	FINAL D.C. RESIST	% CHG. ±(.25% +.05)	FINAL D.C. RESIST.	% CHG. ±(.25% +.05)
	1	1.9911	1.9909	-.01	1.9912	+.02	1.9914	+.01
	2	1.9891	1.9889	-.01	1.9904	+.07	1.9901	+.02
	3	2.0113	2.0101	-.06	2.0107	+.03	2.0109	+.01
	4	1.9944	1.9939	-.03	1.9943	+.02	1.9942	+.01
	5	1.9936	1.9929	-.04	1.9937	+.04	1.9934	-.02
	6	1.9924	1.9919	-.03	1.9928	+.05	1.9929	+.01
	7	2.0020	2.0012	-.04	2.0022	+.05	2.0021	-.01
	8	2.0061	2.0074	+.07	2.0087	+.07	2.0082	-.03
	9	1.9881	1.9871	-.05	1.9879	+.04	1.9872	-.03
	10	2.0045	2.0039	-.03	2.0046	+.04	2.0043	-.02

SWITCH NO.	RESIST. NO.	TERMINAL STRENGTH METHOD PARAGRAPH 4.6.7				REMARKS
		5# PULL	TWIST.	FINAL D.C. RESIST.	% CHG. ±(.2% +.05)	
	1	✓	✓	1.9920	+.03	
	2	✓	✓	1.9905	+.02	
	3	✓	✓	2.0111	+.01	
	4	✓	✓	1.9944	+.01	
	5	✓	✓	1.9938	+.02	
	6	✓	✓	1.9931	+.01	
	7	✓	✓	2.0023	+.01	
	8	✓	✓	2.0091	+.05	
	9	✓	✓	1.9878	+.03	
	10	✓	✓	2.0047	+.02	

[illegible] - Eng

[illegible]
10-10-62

MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP III

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C DATE 30 AUG 62

STYLE RN 60

SWITCH NO.	RESIST NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
1	11	50.114	50.052	50.107	-.02	50K+	
2	12	50.557	50.520	50.547	-.02	50K+	
3	13	50.407	50.333	50.362	-.09	50K+	
4	14	50.012	49.949	49.990	-.05	50K+	
5	15	50.384	50.354	50.399	+.03	50K+	
31	16	50.554	50.540	50.590	+.09	50K+	
32	17	50.074	50.058	50.095	+.04	50K+	
33	18	50.385	50.365	50.389	+.01	50K+	
34	19	50.500	50.469	50.520	+.04	50K+	
35	20	50.171	50.133	50.188	+.03	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05).	FINAL DC RES.	% CHG. ±(.1° +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	% CHG
	11	49.720	-.02	49.700	-.04	50.107	50.122	+.03
	12	50.193	+.06	50.154	-.08	50.547	50.589	+.08
	13	50.095	-.05	50.080	-.03	50.362	50.408	+.09
	14	49.700	+.03	49.677	-.05	49.990	50.015	+.05
	15	50.040	+.01	49.995	-.09	50.399	50.420	+.04
	16	50.213	+.02	50.180	-.07	50.590	50.588	0
	17	49.745	+.04	49.728	-.04	50.095	50.208	+.22
	18	50.047	+.03	50.023	-.05	50.389	50.406	+.03
	19	50.153	+.03	50.140	-.03	50.520	50.532	+.02
	20	49.848	+.01	49.861	+.03	50.188	50.179	-.01

Nathan Putnam - Eng. [illegible] U.S.AEMA

10-10-62

MIL R-10509-D | RESISTOR QUALIFICATION TESTS | GROUP III

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 200K Ω

CHARACTERISTIC C

DATE 30 AUG 62

STYLE RN 60

SWITCH NO.	RESIST NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
16	11	199.11	199.11	199.11	0	50K+	
17	12	199.11	199.12	199.12	+.01	50K+	
18	13	199.50	199.51	199.53	+.02	50K+	
19	14	200.99	200.95	200.99	0	50K+	
20	15	199.92	199.97	200.00	+.04	50K+	
41	16	200.15	200.16	200.21	+.03	50K+	
42	17	200.94	200.96	200.99	+.03	50K+	
43	18	198.66	198.69	198.68	+.01	50K+	
44	19	201.15	201.14	201.13	-.01	50K+	
45	20	199.24	199.26	199.21	-.02	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1° +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	HIGH HUMIDITY % CHG
	11	199.05	-.01	199.00	-.02	199.11	199.42	+.16
	12	199.10	-.02	199.01	-.04	199.12	199.44	+.16
	13	199.45	-.01	199.38	-.04	199.53	199.81	+.14
	14	200.99	+.03	200.89	-.05	200.99	201.24	+.13
	15	199.91	+.01	199.84	-.04	200.00	200.27	+.14
	16	200.12	-.03	200.05	-.04	200.21	200.51	+.15
	17	200.91	+.02	200.85	-.03	200.99	201.30	+.16
	18	198.61	+.02	198.52	-.05	198.68	198.94	+.13
	19	201.14	+.02	201.08	-.02	201.13	201.64	+.25
	20	199.20	+.03	199.13	-.04	199.21	199.50	+.15

Nathan Pritchard - Eng

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10-10-62

MIL R-10509-D **RESISTOR QUALIFICATION TESTS** **GROUP III**

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 301K Ω

CHARACTERISTIC C

DATE 30 AUG 62

STYLE RN 60

SWITCH NO.	RESIST NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES.	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
21	11	299.39	299.41	299.41	+.01	50K+	
22	12	298.65	298.71	298.69	+.02	50K+	
23	13	300.26	300.31	300.23	-.02	50K+	
24	14	300.64	300.71	300.59	-.02	50K+	
25	15	300.24	300.29	300.24	0	50K+	
46	16	300.00	300.01	299.91	-.03	50K+	
47	17	301.59	301.61	301.51	-.03	50K+	
48	18	299.74	299.75	299.71	-.01	50K+	
49	19	301.81	301.81	301.79	-.01	50K+	
50	20	300.23	300.24	300.21	-.01	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1° +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	HIGH HUMIDITY % CHG
	11	299.31	+.08	299.13	-.06	299.41	299.84	+.14
	12	298.62	-.06	298.52	-.04	298.69	299.04	+.12
	13	300.07	-.06	300.07	0	300.23	300.79	+.19
	14	300.59	+.07	300.47	-.04	300.59	301.07	+.16
	15	300.18	-.07	300.09	-.03	300.24	300.81	+.19
	16	299.89	+.09	299.75	-.05	299.91	300.49	+.19
	17	301.49	-.07	301.36	-.04	301.51	302.04	+.18
	18	299.71	+.09	299.54	-.06	299.71	300.22	+.17
	19	301.65	+.07	301.55	-.03	301.79	302.20	+.13
	20	300.15	+.04	300.05	-.03	300.21	300.71	+.17

Nathan Putnam - Eng. [illegible] USAEMA

10-10-62

MIL R-10509-D RESISTOR QUALIFICATION TESTS GROUP III

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C DATE 30 AUG 62

STYLE RN 65

SWITCH NO.	RESIST NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
6	11	50.395	50.364	50.404	+.02	50K+	
7	12	50.009	49.964	50.058	+.10	50K+	
8	13	50.449	50.343	50.395	-.11	50K+	
9	14	50.357	50.336	50.370	+.03	50K+	
10	15	50.550	50.500	50.555	+.01	50K+	
36	16	50.246	50.144	50.194	-.10	50K+	
37	17	49.928	49.910	49.948	+.04	50K+	
38	18	49.914	49.892	49.943	+.06	50K+	
39	19	50.644	50.623	50.670	+.05	50K+	
40	20	50.040	50.035	50.075	+.07	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1° +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	HIGH HUMIDITY % CHG
	11	50066	+.05	50.049	-.04	50.404	50.428	+.05
	12	49665	+.06	49.651	-.03	50.058	50.082	+.05
	13	50115	+.01	50.086	-.06	50.395	50.415	+.04
	14	50009	+.02	50.000	-.02	50.370	50.384	+.03
	15	50.198	+.01	50.185	-.03	50.555	50.569	+.03
	16	49.914	-.01	49.906	-.02	50.194	50.217	+.05
	17	49.557	+.02	49.546	-.02	49.948	50.013	+.13
	18	49.594	+.05	49.586	-.02	49.943	49.981	+.08
	19	50.317	+.02	50.305	-.03	50.670	50.746	+.15
	20	49.701	-.02	49.693	-.02	50.075	50.113	+.08

Nathan [illegible]-Eng. [illegible]

10-10-62

MIL R-10509-D — RESISTOR QUALIFICATION TESTS — GROUP III

DEFECTS ALLOWED 1 — METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 348K Ω

CHARACTERISTIC C — DATE 30 AUG 62

STYLE RN 65

SWITCH NO.	RESIST NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
1	11	346.51	346.56	346.61	+.03	50K+	
2	12	348.91	348.91	348.99	+.03	50K+	
3	13	347.29	347.31	347.21	+.01	50K+	
4	14	347.22	347.24	347.29	+.02	50K+	
5	15	348.21	348.29	348.30	+.03	50K+	
31	16	348.64	348.71	348.69	+.02	50K+	
32	17	347.11	347.21	347.11	0	50K+	
33	18	346.99	347.00	346.91	-.02	50K+	
34	19	349.29	349.32	349.32	+.01	50K+	
35	20	348.59	348.64	348.60	+.01	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1° +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	HIGH HUMIDITY % CHG
	11	346.54	-.02	346.45	-.03	346.61	347.59	+.28
	12	348.93	+.01	348.81	-.04	348.99	349.48	+.14
	13	347.29	+.02	347.16	-.04	347.31	347.84	+.16
	14	347.27	-.01	347.16	-.03	347.29	347.79	+.14
	15	348.28	+.02	348.18	-.03	348.30	348.90	+.17
	16	348.66	-.09	348.51	-.05	348.69	349.26	+.16
	17	347.24	+.03	347.11	-.04	347.11	347.54	+.13
	18	346.99	-.02	346.87	-.04	346.91	347.40	+.14
	19	349.26	+.04	349.14	-.04	349.32	350.08	+.22
	20	348.63	+.04	348.52	-.03	348.60	349.09	+.14

Nathan Pattison - Eng. [illegible signature] 10-16-62

MIL R-10509-D — **RESISTOR QUALIFICATION TESTS** — GROUP III

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 348K Ω

CHARACTERISTIC C

DATE 30 Aug 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
1	11	346.51	346.56	346.61	+.03	50K+	
2	12	348.91	348.91	348.99	+.03	50K+	
3	13	347.29	347.31	347.21	+.01	50K+	
4	14	347.22	347.24	347.29	+.02	50K+	
5	15	348.21	348.29	348.30	+.03	50K+	
31	16	348.64	348.71	348.69	+.02	50K+	
32	17	347.11	347.21	347.11	0	50K+	
33	18	346.99	347.00	346.91	−.02	50K+	
34	19	349.29	349.32	349.32	+.01	50K+	
35	20	348.59	348.64	348.60	+.01	50K+	

SWITCH NO.	RESIST. NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1° +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	% CHG
	11	346.54	−.02	346.45	−.03	346.61	347.59	+.28
	12	348.93	+.01	348.81	−.04	348.99	349.48	+.14
	13	347.29	+.02	347.16	−.04	347.31	347.84	+.16
	14	347.27	−.01	347.16	−.03	347.29	347.79	+.14
	15	348.28	+.02	348.18	−.03	348.30	348.90	+.17
	16	348.66	−.09	348.51	−.05	348.69	349.26	+.16
	17	347.24	+.03	347.11	−.04	347.11	347.54	+.13
	18	346.99	−.02	346.87	−.04	346.91	347.40	+.14
	19	349.26	+.04	349.14	−.04	349.32	350.08	+.22
	20	348.63	+.04	348.52	−.03	348.60	349.09	+.14

Nathan Pattison - Eng.

[illegible] 10-10-62

MIL R-10509-D — RESISTOR QUALIFICATION TESTS — GROUP III

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 499K Ω

CHARACTERISTIC C

DATE 30 AUG 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
6	11	499.49	499.49	499.60	+.02	50K+	
7	12	499.61	499.71	499.72	+.02	50K+	
8	13	500.09	500.09	500.13	+.01	50K+	
9	14	500.29	500.28	500.31	+.01	50K+	
10	15	501.51	501.54	501.61	+.02	50K+	
36	16	500.39	500.46	500.43	+.01	50K+	
37	17	497.51	497.62	497.51	0	50K+	
38	18	501.32	501.41	501.31	0	50K+	
39	19	500.07	500.11	500.07	0	50K+	
40	20	500.63	500.71	500.69	+.01	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1% +.05)	INITIAL RESIST. (MTD.)	HIGH HUMIDITY FINAL DC RES	% CHG
	11	499.45	+.06	499.30	-.03	499.60	500.20	+.12
	12	499.65	-.01	499.48	-.02	499.72	500.39	+.14
	13	500.09	+.02	499.99	-.02	500.13	500.79	+.13
	14	500.45	0	500.28	-.03	500.31	501.24	+.19
	15	501.48	+.07	501.30	-.04	501.61	502.09	+.10
	16	500.41	+.02	500.22	-.04	500.43	501.30	+.19
	17	497.59	0	497.41	-.04	497.51	498.08	+.11
	18	501.31	+.02	501.16	-.03	501.31	501.88	+.11
	19	500.03	+.03	499.89	-.03	500.07	500.70	+.12
	20	500.76	-.01	500.50	-.05	500.69	501.29	+.12

Nathan Putman

Noel [illegible]

10-10-62

MIL R-10509-D | RESISTOR QUALIFICATION TESTS | GROUP III

DEFECTS ALLOWED 1 | METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 2 M Ω

CHARACTERISTIC C | DATE 30 Aug 62

STYLE RN 75

SWITCH NO.	RESIST. NO.	ATMOS DIELEC WITHSTAND VOLT METH PARAGRAPH 4.6.8		RED. PRESS. 450V RMS. DIELECT. TEST METH. PAR. 4.6.8.2		INSULATION RESISTANCE METH. PARAG. 4.6.9 10,000 MEG. MIN.	
		INIT D.C. RESIST.	FINAL D.C. RES	FINAL RESIST DC	TOTAL % CHG. ±(.25+.05)	MEGOHMS	REMARKS
16	11	1.9972	1.9980	1.9981	+.04	50K+	
17	12	1.9921	1.9921	1.9921	0	50K+	
18	13	1.9911	1.9906	1.9914	+.02	50K+	
19	14	1.9900	1.9900	1.9911	+.06	50K+	
20	15	1.9954	1.9949	1.9961	+.03	50K+	
41	16	1.9923	1.9926	1.9931	+.04	50K+	
42	17	2.0054	2.0063	2.0060	+.01	50K+	
43	18	1.9971	1.9971	1.9971	0	50K+	
44	19	1.9941	1.9941	1.9941	0	50K+	
45	20	1.9861	1.9869	1.9861	0	50K+	

SWITCH NO.	RESIST NO.	TEMP. CYCLING METH. PARA. 4.6.4		350°C SOLDER DIP METH. PAR. 4.6.10		MOISTURE RESISTANCE METH. PARAGRAPH 4.6.11		
							HIGH HUMIDITY	
		FINAL RESIST.	% CHG. ±(.25 +.05)	FINAL DC RES.	% CHG. ±(.1 +.05)	INITIAL RESIST. (MTD.)	FINAL DC RES	% CHG
	11	1.9976	+.06	1.9971	-.03	1.9981	1.9984	+.01
	12	1.9921	+.08	1.9919	-.01	1.9921	1.9933	+.06
	13	1.9905	+.03	1.9899	-.03	1.9914	1.9931	+.08
	14	1.9899	+.06	1.9891	-.04	1.9911	1.9892	-.10
	15	1.9950	+.06	1.9940	-.05	1.9961	1.9979	+.09
	16	1.9923	+.08	1.9919	-.02	1.9931	1.9919	-.06
	17	2.0059	+.01	2.0052	-.04	2.0060	2.0069	-.05
	18	1.9965	+.07	1.9962	-.01	1.9971	1.9969	-.01
	19	1.9935	+.05	1.9931	-.02	1.9941	1.9932	-.04
	20	1.9860	+.05	1.9859	-.01	1.9861	1.9861	0

Nathan Patterson

[illegible] 10-10-62

MIL R-10509D — RESISTOR QUALIFICA[illegible]N TESTS — GROUP III

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C

DATE 10 SEPT 62

* STYLE RN 60

SWITCH NO.	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E				REMARKS
		HIGH HUMIDITY		AMBIENT		
		FINAL D.C. RESIST.	% CHG.	FINAL D.C. RESIST	% CHG (.5% ALLOW)	
1	11	50.193	+.17	50.122	+.03	
2	12	50.678	+.26	50.589	+.08	
3	13	50.490	+.26	50.408	+.05	
4	14	50.118	+.26	50.015	+.09	
5	15	50.495	+.19	50.420	+.04	
31	16	50.677	+.18	50.588	−.00	
32	17	50.185	+.18	50.208	+.22	
33	18	50.510	+.24	50.406	+.03	
34	19	50.614	+.19	50.532	+.02	
35	20	50.269	+.16	50.179	−.01	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

Nathan Pritikin Eng.

[illegible]
U.S.AEMA 10-10-62

MIL R-10509D RESISTOR QUALIFICATION TESTS GROUP III

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4 4.6.10, 4.6.11

NOMINAL RESISTANCE 200K Ω

CHARACTERISTIC C DATE 10 SEPT 62

STYLE RN 60

SWITCH NO.	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E — HIGH HUMIDITY: FINAL D.C. RESIST.	% CHG.	AMBIENT: FINAL D.C. RESIST	% CHG (.5% ALLOW)	REMARKS
16	11	199.41	+.15	199.42	+ .16	
17	12	199.42	+.15	199.44	+ .16	
18	13	199.81	+.14	199.81	+ .14	
19	14	201.14	+.08	201.24	+ .13	
20	15	200.25	+.13	200.27	+ .14	
41	16	200.50	+.15	200.51	+ .15	
42	17	201.31	+.16	201.30	+ .16	
43	18	198.59	+.05	198.94	+ .13	
44	19	201.69	+.28	201.64	+ .25	
•45	20	199.51	+.15	199.50	+ .15	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

Matthew Putchen - Eng

[illegible] U.S.A.E.R.A 10-10-62

MIL R-10509D RESISTOR QUALIFIC[illegible] TESTS GROUP III

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 301 K Ω

CHARACTERISTIC C

DATE 10 SEPT 62

STYLE RN 60

SWITCH NO.	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E — HIGH HUMIDITY: FINAL D.C. RESIST.	HIGH HUMIDITY: % CHG.	AMBIENT: FINAL D.C. RESIST	AMBIENT: % CHG (.5% ALLOW)	REMARKS
21	11	299.52	+.04	299.84	+.14	
22	12	298.90	+.07	299.04	+.12	
23	13	300.52	+.10	300.79	+.19	
24	14	301.01	+.14	301.07	+.16	
25	15	299.04	-.40	300.81	+.19	
46	16	300.49	+.20	300.49	+.19	
47	17	301.90	+.13	302.04	+.18	
48	18	300.20	+.16	300.22	+.17	
49	19	302.06	+.09	302.20	+.13	
50	20	300.71	+.17	300.71	+.17	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

Nathan Peterson Eng.

[illegible] U.S.A.E.M.A. 10-10-62

MIL R-10509D RESISTOR QUALIFIC N TESTS GROUP III

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C DATE 10 SEPT 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E				REMARKS
		HIGH HUMIDITY		AMBIENT		
		FINAL D.C. RESIST.	% CHG.	FINAL D.C. RESIST	% CHG (.5% ALLOW)	
6	11	50.520	+.23	50.428	+.05	
7	12	50.182	+.25	50.082	+.05	
8	13	50.514	+.24	50.415	+.04	
9	14	50.470	+.20	50.384	+.03	
10	15	50.665	+.22	50.569	+.08	
36	16	50.309	+.23	50.217	+.05	
37	17	50.086	+.30	50.013	+.13	
38	18	50.060	+.23	49.981	+.08	
39	19	50.890	+.30	50.746	+.15	
40	20	50.124	+.10	50.113	+.08	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

[illegible signature]

[illegible signature]
U.S.AEMA - 10-10-62

MIL R-10509D RESISTOR QUALIFICATION TESTS GROUP III

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 348K Ω

CHARACTERISTIC C DATE 10 SEPT 62

STYLE RN 65

SWITCH NO. *	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E — HIGH HUMIDITY: FINAL D.C. RESIST.	HIGH HUMIDITY: % CHG.	AMBIENT: FINAL D.C. RESIST	AMBIENT: % CHG (.5% ALLOW)	REMARKS
1	11	346.00	-.17	347.59	+.28	
2	12	348.61	-.11	349.48	+.14	
3	13	347.79	+.14	347.84	+.16	
4	14	346.62	-.20	347.79	+.14	
5	15	348.10	-.06	348.90	+.17	
31	16	348.33	-.10	349.26	+.16	
32	17	347.53	+.12	347.54	+.13	
33	18	347.41	+.14	347.40	+.14	
34	19	350.08	+.21	350.08	+.22	
35	20	349.07	+.13	349.09	+.14	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

[illegible] -Eng.

[illegible]
USAERA 10-10-62

MIL R-10509D RESISTOR QUALIFICATION TESTS GROUP III

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 499K Ω

CHARACTERISTIC C DATE 10 SEPT 62

STYLE RN 65

SWITCH NO.	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E				REMARKS
		HIGH HUMIDITY		AMBIENT		
		FINAL D.C. RESIST.	% CHG.	FINAL D.C. RESIST	% CHG (.5% ALLOW)	
6	11	499.40	-.04	500.20	+.12	
7	12	500.30	+.12	500.39	+.14	
8	13	500.90	+.15	500.79	+.13	
9	14	501.29	-.01	501.24	+.19	
10	15	500.82	+.04	502.08	+.10	
36	16	501.41	-.01	501.30	+.19	
37	17	498.29	+.16	498.08	+.11	
38	18	502.04	+.15	501.88	+.11	
39	19	497.50	-.51	500.70	+.12	
40	20	501.40	+.14	501.29	+.12	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

Nathan Pritiken Eng.

[illegible] USAEMIA - 10-10-62

MIL R-10509D RESISTOR QUALIFIC[illegible] TESTS GROUP III

DEFECTS ALLOWED 1 METH[illegible] PARAGRAPH: 4.6.8, 4.6.9, 4.6.4, 4.6.10, 4.6.11

NOMINAL RESISTANCE 2 M Ω

CHARACTERISTIC C DATE 10 SEPT 62

STYLE RN 75

SWITCH NO.	RESIST. NO.	DIELECTRIC WITHSTANDING and INSULATION RES. (100 MEG.-MIN.) METHOD PARAGRAPH 4.6.11E				REMARKS
		HIGH HUMIDITY		AMBIENT		
		FINAL D.C. RESIST.	% CHG.	FINAL D.C. RESIST	% CHG (.5% ALLOW)	
16	11	1.9991	+.05	1.9984	-.01	
17	12	1.9923	+.01	1.9933	+.06	
18	13	1.9948	+.17	1.9931	+.08	
19	14	1.9481	-2.3	1.9892	-.10	
20	15	1.9951	-.05	1.9979	+.09	
41	16	1.9940	+.04	1.9919	-.06	
42	17	2.0079	+.09	2.0068	+.05	
43	18	1.9985	+.07	1.9969	-.01	
44	19	1.9939	-.01	1.9932	-.04	
45	20	1.9880	+.09	1.9861	0	

* ON MOISTURE RESISTANCE TESTS, 5 RESISTORS HAVE A POLARIZING VOLTAGE ("P") OF 100 V.D.C. APPLIED BETWEEN THE LEADS AND A POLARIZING STRAP IN CONTACT WITH THE BODY OF THE RESISTOR. THE REMAINING FIVE ARE LOADED ("L") TO 100% RATED WATTAGE UNLESS THE RESISTANCE IS ABOVE THE CRITICAL VALUE.

Nathan Patterson - Eng.

[illegible] USAEMA 10-10-62

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 49.9 Ω OVEN NO. ________ DATE 28 AUG 62

CHARACTERISTIC C TEMP. COEFFICIENT: 50 PPM CHAR. C.F.

25 PPM CHAR. E

STYLE RN 60

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±5°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
1	21	50.280	50.170	+33	50.133	+25	50.235
2	22	50.175	50.101	+18	50.088	+20	50.135
3	23	49.948	49.879	+13	49.882	+13	49.905
4	24	50.042	49.962	+22	49.949	+26	50.005
5	25	50.233	50.167	+15	50.170	+13	50.196
6	26	50.119	49.996	+40	49.946	+30	50.078
11	27	49.988	49.873	+42	49.822	+35	49.958
8	28	50.378	50.314	+13	50.320	+5	50.336
9	29	50.298	50.172	+40	50.123	+32	50.253
10	30	49.932	49.895	-8	49.928	-25	49.880

SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST. 175°C±3°C	TC PPM/°C	REMARKS
1	21	50.322	+43	50.412	+24	
2	22	50.217	+40	50.180	+6	
3	23	49.964	+30	49.891	-2	
4	24	50.080	+38	50.052	+6	
5	25	50.268	+37	50.208	+26	
6	26	50.173	+48	50.305	+30	
11	27	50.035	+37	50.055	+13	
8	28	50.376	+20	50.310	-3	
9	29	50.243	+45	50.484	+29	
10	30	49.890	+5	49.680	-24	

NOTE: RESISTORS MUST BE STABILIZED ± 1 C FOR 30 - 45 MINUTES BEFORE READING RESISTANCE.

Nathan [illegible] - Eng

Noel MacFarlane [illegible]
USAEMA 10-10-62

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 200K Ω OVEN NO. ________ DATE 28 Aug 62

CHARACTERISTIC C TEMP. COEFFICIENT: 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 60

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
1	21	200.61	200.37	+30	200.39	+14	200.56
2	22	200.17	200.03	+17.5	199.98	+12	200.20
3	23	200.35	200.31	+5	200.30	+3	200.34
4	24	200.31	200.04	+35	199.28	+27	200.31
5	25	199.88	199.63	+31	199.54	+21	199.85
6	26	199.51	199.31	+25	199.20	+19	199.52
7	27	200.86	200.64	+27.5	200.55	+19	200.83
8	28	199.21	199.07	+17.5	199.05	+10	199.14
9	29	198.91	198.64	+34	198.51	+25	198.83
10	30	199.60	199.54	+7.5	199.60	0	199.61

SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST. 175°C±3°C	TC PPM/°C	REMARKS
1	21	200.89	+41	201.34	+26	
2	22	200.38	+22.5	201.00	+27	
3	23	200.47	+16	200.95	+20	
4	24	200.59	+35	201.31	+33	
5	25	200.13	+35	200.89	+34	
6	26	199.77	+31	200.41	+30	
7	27	201.05	+27.5	200.52	-10	
8	28	199.31	+21	199.64	+17	
9	29	199.08	+31	199.34	+17	
10	30	199.72	+13.7	200.12	+17	

NOTE RESISTORS MUST BE STABILIZED ± 1°C FOR 30 - 45 MINUTES BEFORE READING

MIL R-10509 D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 301 K Ω OVEN NO. ________ DATE 28 AUG 62

CHARACTERISTIC C TEMP. COEFFICIENT: 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 60

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
15	21	299.70	299.96	-22	300.24	-26.6	299.72
16	22	300.01	300.21	-20	300.61	-22.4	300.03
17	23	299.10	299.62	-11	299.81	-17	299.39
18	24	299.61	299.80	-16	300.02	-17	299.63
19	25	298.92	299.02	-7.5	299.31	-25.8	299.33
20	26	299.23	299.41	-15	299.70	-19.5	299.24
21	27	300.41	300.50	-7.5	300.72	-12.9	300.41
22	28	303.11	303.41	-25	303.79	-22.2	303.12
23	29	300.22	300.31	-6.7	301.20	-15.4	300.82
24	30	300.25	301.13	-22.5	301.61	-31.6	300.87

SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST 175°C±3°C	TC PPM/°C	REMARKS
15	21	299.61	-3.1	299.52	-4.4	
16	22	300.14	+4.2	300.20	+4.6	
17	23	299.31	-6.6	299.19	-4.4	
18	24	299.71	+6.6	300.14	+11.2	
19	25	298.90	-2.5	298.82	-2.4	
20	26	299.12	-9.1	299.02	-4.3	
21	27	300.44	+2.5	300.53	+2.6	
22	28	302.96	-13.3	302.65	-10.4	
23	29	300.21		300.23	+1.5	
24	30	300.71	-13.2	300.55	-7	

Nathan Putilin - Eng. Saul McCrackin ? USAERMA 10-10-62

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 **METHOD PARAGRAPH:** 4.6.12

NOMINAL RESISTANCE 49.9 Ω **OVEN NO.** ______ **DATE** 28 AUG 62

CHARACTERISTIC C **TEMP. COEFFICIENT:** 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 65

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
15	21	49.881	49.818	+ 5	49.840	- 8	49.826
16	22	50.037	49.920	+30	49.880	+23	49.977
17	23	50.353	50.260	+25	50.243	+30	50.307
18	24	50.399	50.256	+44	50.205	+33	50.344
19	25	50.260	50.169	+21	50.158	+14	50.212
20	26	50.100	49.995	+25	49.981	+15	50.042
21	27	50.183	50.067	+35	50.031	+27	50.138
22	28	50.024	49.905	+33	49.870	+25	49.971
23	29	50.069	50.002	+10	50.009	+7	50.022
24	30	49.886	49.759	+38	49.717	+28	49.832

	SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST. 175°C±3°C	TC PPM/°C	REMARKS
	15	21	49.853	+15	49.746	-10	
	16	22	50.056	+40	50.111	+18	
	17	23	50.356	+25	50.396	+12	
*	18	24	50.468	+62	50.626	+37	OUT OF TOLERANCE
	19	25	50.260	+25	50.278	+ 9	
	20	26	50.104	+30	50.142	+13	
	21	27	50.229	+45	50.301	+23	
	22	28	50.064	+46	50.168	+26	
	23	29	50.055	+17	50.017	0	
	24	30	49.928	+48	50.072	+31	

* THE 65°C TC WAS READ AFTER LOAD LIFE AND WAS FOUND TO BE + 38 PPM.

NOTE: RESISTORS MUST BE STABILIZED ± 1°C FOR 30 - 45 MINUTES BEFORE READING RESISTANCE.

Nathan [illegible] -Eng.

[illegible]

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 348K Ω

OVEN NO. ______ DATE 28 AUG 62

CHARACTERISTIC C

TEMP. COEFFICIENT: 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 65

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
27	21	348.61	348.62	-.7	348.76	-5.4	348.61
28	22	348.41	347.97	+31.5	347.72	+25	348.33
29	23	346.71	346.51	+14.3	346.41	+11	346.63
30	24	347.41	347.43	-1.4	347.51	-3.6	347.42
31	25	347.39	346.93	+33	346.67	+26	347.33
32	26	347.93	347.61	+23	347.44	+17.5	347.89
33	27	348.54	348.04	+36	347.74	+29	348.51
34	28	348.07	347.83	+17	347.72	+12.5	348.06
35	29	348.41	347.91	+36	347.52	+32	348.39
36	30	349.08	348.93	+10.8	348.88	+7.2	349.09

SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST 175°C±3°C	TC PPM/°C	REMARKS
27	21	348.71	+7.2	348.56	-.1	
28	22	348.87	+39	350.13	+32	
29	23	347.02	+23.7	347.71	+19	
30	24	347.70	+20	347.93	+9.7	
31	25	347.83	+36	349.21	+36	
32	26	348.84	+32	349.24	+26	
33	27	349.03	+37	350.59	+29.5	
34	28	348.41	+25	349.28	+24	
35	29	349.01	+44	350.59	+42	
36	30	349.28	+17	349.81	+13.7	

NOTE: RESISTORS MUST BE STABILIZED ± 1°C FOR 30 - 45 MINUTES BEFORE READING RESISTANCE.

Nathan Patterson - Eng.

[illegible]
[illegible] 10-10-62

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 | METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 499K Ω | OVEN NO. ______ DATE 28 Aug 62

CHARACTERISTIC C | TEMP. COEFFICIENT: 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 65

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
16	21	497.91	497.90	0	498.09	-4	497.94
17	22	49644	496.53	-5	496.91	-12	496.51
18	23	49543	495.72	-15	496.22	-20	49549
19	24	501.91	501.51	+20	501.43	+12	501.91
20	25	500.08	500.20	-7	500.51	-11	500.12
21	26	499.31	498.79	+26	498.61	+18	499.29
22	27	499.38	499.62	-13	500.11	-19	499.42
23	28	500.21	499.61	+30	499.20	+25	500.20
24	29	497.21	496.71	+25	496.54	+17	497.11
25	30	499.99	50003	-3	500.32	-9	499.99

SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST. 175°C±3°C	TC PPM/°C	REMARKS
16	21	498.07	+8	498.61	+9	
17	22	496.59	+5	497.00	+7	
18	23	495.33	-8	494.84	-9	
19	24	502.43	+25	503.94	+26	
20	25	500.31	+10	501.02	+11	
21	26	499.94	+33	501.81	+33	
22	27	499.42	0	499.60	+4	
23	28	501.06	+42	503.30	+40	
24	29	497.79	+45	499.53	+32	
25	30	500.07	+5	500.79	+11	

NOTE: RESISTORS MUST BE STABILIZED ± 1°C FOR 30 - 45 MINUTES BEFORE READING RESISTANCE.

Vaughan Pritchard - Eng.

[illegible]
[illegible] 10-10-62

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 | METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 2 M Ω | OVEN NO. ______ DATE 28 AUG 62

CHARACTERISTIC C | TEMP. COEFFICIENT: 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 75

SWITCH NO.	RESIST NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
1	21	2.0011	2.0026	−19	2.0051	−25	2.0020
2	22	1.9884	1.9891	− 9	1.9901	−11	1.9889
11	23	1.9853	1.9844	+11	1.9841	+7.5	1.9870
4	24	1.9812	1.9803	+11	1.9791	+13	1.9801
5	25	2.0045	2.0025	+25	2.0019	+16	2.0046
6	26	2.0061	2.0081	−25	2.0103	−26	2.0062
7	27	1.9950	1.9932	+22	1.9931	+12	1.9947
8	28	2.0012	1.9991	+25	1.9979	+21	2.0012
9	29	2.0087	2.0112	−31	2.0145	−36	2.0088
10	30	2.0058	2.0083	−31	2.0114	−35	2.0059

	SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST 175°C±3°C	TC PPM/°C	REMARKS
	1	21	2.0014	−7.5	2.0000	−6.7	
	2	22	1.9891	+2.5	1.9879	−3	
*	11	23	2.0001	+163	2.0055	+61.5	OUT OF TOLERANCE
	4	24	1.9898	+48	1.9913	+37	
	5	25	2.0071	+31	2.0142	+32	
	6	26	2.0070	+10	2.0071	+3	
	7	27	1.9971	+30	2.0039	+30	
	8	28	2.0040	+35	2.0121	+36	
	9	29	2.0069	−24	2.0011	−26	
	10	30	2.0045	−17	2.0002	−19	

* AT THE START OF THE LOAD LIFE TEST 1 LEAD WAS FOUND TO HAVE HAD A COLD SOLDER JOINT AND WAS NOT FIRMLY ATTACHED TO THE TERMINAL. AFTER LOAD LIFE THE 65°C T.C. WAS TAKEN AND WAS FOUND TO BE +7 PPM.

NOTE: RESISTORS MUST BE STABILIZED ± 1°C FOR 30 - 45 MINUTES BEFORE READING RESISTANCE.

Nathan Patterson - Eng.

[illegible] USAEMA 10-10-62

MIL R-10509-D RESISTOR TEMPERATURE COEFFICIENT QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.12

NOMINAL RESISTANCE 2 M Ω OVEN NO. ______ DATE 28 AUG 62

CHARACTERISTIC C TEMP. COEFFICIENT: 50 PPM CHAR. C.F.
25 PPM CHAR. E

STYLE RN 75

SWITCH NO.	RESIST. NO.	DC RES 25°C±3	DC RES -15±3°C	T.C. PPM/°C	DC RES -55°±3°C	T.C. PPM/°C	DC RES 25°C±3°C
1	21	2.0011	2.0026	-19	2.0051	-25	2.0020
2	22	1.9884	1.9891	- 9	1.9901	-11	1.9889
11	23	1.9853	1.9844	+11	1.9841	+7.5	1.9870
4	24	1.9812	1.9803	+11	1.9791	+13	1.9801
5	25	2.0045	2.0025	+25	2.0019	+16	2.0046
6	26	2.0061	2.0081	-25	2.0103	-26	2.0062
7	27	1.9950	1.9932	+22	1.9931	+12	1.9947
8	28	2.0012	1.9991	+25	1.9979	+21	2.0012
9	29	2.0087	2.0112	-31	2.0145	-36	2.0088
10	30	2.0058	2.0083	-31	2.0114	-35	2.0059

SWITCH NO.	RESIST. NO.	DC RES. 65°C±3°C	T.C. PPM/°C	DC RESIST. 175°C±3°C	TC PPM/°C	REMARKS
1	21	2.0014	-7.5	2.0000	-6.7	
2	22	1.9891	+2.5	1.9879	-3	
* 11	23	2.0001	+163	2.0055	+61.5	OUT OF TOLERANCE
4	24	1.9898	+48	1.9913	+37	
5	25	2.0071	+31	2.0142	+32	
6	26	2.0070	+10	2.0071	+3	
7	27	1.9971	+30	2.0029	+30	
8	28	2.0040	+35	2.0121	+36	
9	29	2.0069	-24	2.0011	-26	
10	30	2.0045	-17	2.0002	-19	

* AT THE START OF THE LOAD LIFE TEST 1 LEAD WAS FOUND TO HAVE HAD A COLD SOLDER JOINT AND WAS NOT FIRMLY ATTACHED TO THE TERMINAL. AFTER LOAD LIFE THE [illegible] T.C WAS TAKEN AND WAS FOUND TO BE [illegible] PPM.

NOTE: RESISTORS MUST BE STABILIZED ± 1°C FOR 30 - 45 MINUTES BEFORE READING RESISTANCE.

[illegible] - Eng.

[illegible] USAEMA 10-10-62

MIL R-10509-D RESISTOR LOAD LIFE QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 (INCLUDES T.C.) METHOD PARAGRAPH: 4.6.13 1000 HRS

NOMINAL RESISTANCE 49.9 Ω OVEN NO. 2 START DATE 29 Aug 62

CHARACTERISTIC C LOAD VOLTAGE 2.5V

STYLE RN 60 MAXIMUM SHIFT: ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-31 HR 1600		100 ± 8 HR. DATE 9-2 HR 1200		250 ± 8 HR. DATE 9-8 HR 1600	
			DC RES. 125°C	% CHG.	DC RES. 125°C	% CHG.	DC RES. 125°C	% CHG.
1	21	50.397	50.406	+.02	50.440	+.09	50.474	+.15
2	22	50.150	50.177	+.05	50.209	+.12	50.245	+.19
3	23	49.904	49.900	-.01	49.926	+.04	49.950	+.09
4	24	50.044	50.047	+.01	50.073	+.06	50.081	+.09
5	25	50.231	50.245	+.03	50.278	+.10	50.310	+.16
6	26	50.268	50.278	+.02	50.313	+.09	50.343	+.15
7	27	50.227	50.225	0	50.253	+.05	50.286	+.12
8	28	50.447	50.447	0	50.482	+.07	50.516	+.14
9	29	50.450	50.471	+.04	50.504	+.11	50.527	+.15
10	30	49.740	49.740	0	49.768	+.06	49.790	+.10

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-19 HR. 1000		750 ± 12 HR. DATE 9-29 HR. 1000		1000 ± 12 HR. DATE 10-10 HR. 1100		REMARKS
		D.C.RES. 125°C	% CHG.	D.C.RES. 125°C	% CHG.	D.C.RES. 125°C	% CHG.	
1		50.466	+.14	50.497	+.20	50.543	+.29	
2		50.246	+.19	50.274	+.25	50.325	+.35	
3		49.928	+.05	49.953	+.10	49.997	+.19	
4		50.073	+.06	50.096	+.10	50.144	+.20	
5		50.296	+.13	50.327	+.19	50.375	+.29	
6		50.338	+.14	50.362	+.19	50.408	+.28	
7		50.276	+.10	50.292	+.13	50.351	+.25	
8		50.525	+.16	50.547	+.20	50.592	+.29	
9		50.525	+.15	50.550	+.20	50.597	+.29	
10		49.781	+.08	49.828	+.18	49.875	+.27	

[signature] - Eng

[signature] USAERMA 10-10-62

MIL R-10509-D RESISTOR LOAD LIFE QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 (INCLUDES T.C.) METHOD PARAGRAPH: 4.6.13 1000 HRS

NOMINAL RESISTANCE 200K Ω OVEN NO. 2 START DATE 29 AUG 62

CHARACTERISTIC C LOAD VOLTAGE 158V

STYLE RN 60 MAXIMUM SHIFT: ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-31 HR 1600 DC RES. 125°C	% CHG.	100 ± 8 HR. DATE 9-2 HR 1200 DC RES. 125°C	% CHG.	250 ± 8 HR. DATE 9-8 HR 1600 DC RES. 125°C	% CHG.
1	21	201.49	201.71	+.11	201.72	+.12	201.90	+.20
2	22	201.00	201.21	+.11	201.29	+.15	201.40	+.20
3	23	201.07	201.31	+.12	201.33	+.13	201.51	+.22
4	24	201.21	201.41	+.10	201.40	+.10	201.53	+.16
5	25	200.91	201.27	+.18	201.30	+.20	201.41	+.25
6	26	200.32	200.51	+.10	200.51	+.10	200.60	+.14
7	27	201.59	201.81	+.11	201.81	+.11	201.34	+.12
8	28	199.79	200.03	+.12	200.06	+.14	200.23	+.22
9	29	199.45	199.72	+.14	199.74	+.15	199.90	+.23
10	30	200.22	200.44	+.11	200.43	+.11	200.63	+.21

*

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-13 HR. 1000 D.C.RES. 125°C	% CHG.	750 ± 12 HR. DATE 9-29 HR. 1000 D.C.RES. 125°C	% CHG.	1000 ± 12 HR. DATE 10-10 HR. 1100 D.C.RES. 125°C	% CHG.	REMARKS
1		201.99	+.25	201.74	+.13	201.81	+.16	
2		201.51	+.26	201.07	+.04	201.08	+.04	
3		201.49	+.21	201.31	+.12	201.41	+.17	
4		201.61	+.20	201.36	+.08	201.45	+.12	
5		201.53	+.31	200.75	-.08	200.84	-.04	
6		200.68	+.31	200.71	+.20	200.86	+.27	
7		202.03	+.22	201.71	+.06	201.90	+.16	
8		200.34	+.28	200.26	+.20	200.37	+.29	
9		200.01	+.28	200.00	+.28	200.14	+.34	
10		200.62	+.20	200.45	+.12	200.59	+.19	

* NOTE: SOMETIME FROM 9-19 TO 9-29 POWER SUPPLY WENT OUT OF CONTROL AND WAS OBSERVED AT 350V. NUMBER OF HOURS AT THIS VOLTAGE WAS PROBABLY LESS THAN 24 HRS.

Nathan Putikin - Eng.

10-10-62

Witnessed [illegible] USAEMA

MIL R-10509-D **RESISTOR LOAD LIFE QUALIFICATION TESTS** **GROUP IV**

DEFECTS ALLOWED 1 (INCLUDES T.C.) METHOD PARAGRAPH: 4.6.13 1000 HRS

NOMINAL RESISTANCE 301 K Ω OVEN NO. 2 START DATE 29 AUG 62

CHARACTERISTIC C LOAD VOLTAGE 194 V

STYLE RN 60 MAXIMUM SHIFT: ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-31 HR 1600 DC RES. 125°C	% CHG.	100 ± 8 HR. DATE 9-2 HR 1200 DC RES. 125°C	% CHG.	250 ± 8 HR. DATE 9-8 HR 1600 DC RES. 125°C	% CHG.
15	21	299.97	300.26	+ .10	300.30	+.11	300.52	+.18
16	22	300.67	301.01	+ .11	300.99	+.11	301.30	+.21
17	23	299.61	299.91	+ .10	300.00	+.13	300.10	+.17
18	24	300.51	300.93	+ .14	301.02	+.17	301.30	+.27
19	25	299.19	299.50	+ .11	299.61	+.14	299.80	+.20
20	26	299.41	299.72	+ .11	299.77	+.12	299.99	+.20
21	27	300.85	301.21	+ .12	301.20	+.12	301.41	+.19
22	28	303.21	303.52	+ .10	303.60	+.13	303.82	+.20
23	29	301.21	301.51	+ .10	301.59	+.13	301.79	+.19
24	30	301.02	301.39	+ .12	301.41	+.13	301.66	+.21

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-19 HR. 1000 D.C.RES. 125°C	% CHG.	750 ± 12 HR. DATE 9-29 HR. 1000 D.C.RES. 125°C	% CHG.	1000 ± 12 HR. DATE 10-10 HR. 1100 D.C.RES. 125°C	% CHG.	REMARKS
15		300.72	+.25	300.84	+.29	300.81	+.28	
16		301.52	+.28	301.62	+.32	301.90	+.41	
17		300.31	+.23	300.47	+.29	300.41	+.27	
18		301.45	+.31	301.62	+.37	301.60	+.36	
19		299.94	+.25	300.08	+.30	300.09	+.30	
20		300.14	+.24	300.31	+.30	300.31	+.30	
21		301.64	+.26	301.79	+.31	301.79	+.28	
22		304.09	+.29	304.14	+.31	304.11	+.30	
23		301.99	+.26	302.09	+.29	302.07	+.28	
24		301.89	+.26	302.00	+.32	301.98	+.32	

Nathan Pritchar – Eng.

Neil McFarlane [illegible]
USAERMA 10-10-62

MIL R-10509-D RESISTOR LOAD LIFE QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 (INCLUDES T.C.) METHOD PARAGRAPH: 4.6.13 1000 HRS

NOMINAL RESISTANCE 49.9 Ω OVEN NO. 3 START DATE 29 AUG 62

CHARACTERISTIC C LOAD VOLTAGE 3.5 V

STYLE RN 65 MAXIMUM SHIFT: ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-31 HR 1600		100 ± 8 HR. DATE 9-2 HR 1200		250 ± 8 HR. DATE 9-8 HR 1600	
			DC RES. 125°C	% CHG.	DC RES. 125°C	% CHG.	DC RES. 125°C	% CHG.
15	21	49.790	49.748	-.08	49.762	-.06	49.782	-.01
16	22	50.103	50.081	-.04	50.107	+.01	50.149	+.09
17	23	50.320	50.275	-.09	50.305	+.01	50.420	+.06
18	24	50.594	50.600	+.01	50.626	+.06	50.657	+.13
19	25	50.283	50.276	-.03	50.304	+.03	50.349	+.12
20	26	50.157	50.167	+.02	50.172	+.03	50.208	+.10
21	27	50.288	50.271	-.03	50.289	0	50.320	+.06
22	28	50.147	50.169	+.04	50.194	+.10	50.233	+.17
23	29	50.047	50.026	-.02	50.063	+.03	50.088	+.10
24	30	50.035	50.030	-.01	50.061	+.05	50.080	+.11

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-19 HR. 1000		750 ± 12 HR. DATE 9-29 HR. 1000		1000 ± 12 HR. DATE 10-10 HR. 1100		REMARKS
		D.C.RES. 125°C	% CHG.	D.C.RES. 125°C	% CHG.	D.C.RES. 125°C	% CHG.	
15		49.765	-.03	49.797	+.02	49.840	+.10	
16		50.157	+.11	50.191	+.18	50.241	+.28	
17		50.402	+.03	50.472	+.06	50.460	+.14	
18		50.650	+.11	50.674	+.16	50.712	+.24	
19		50.360	+.14	50.397	+.22	50.445	+.31	
20		50.210	+.11	50.242	+.17	50.288	+.26	
21		50.312	+.05	50.333	+.09	50.371	+.17	
22		50.236	+.18	50.263	+.23	50.307	+.32	
23		50.086	+.08	50.105	+.12	50.145	+.20	
24		50.092	+.12	50.116	+.16	50.161	+.25	

Nathan Dutchman - Eng.

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USAEMA 10-10-62

MIL R-10509 D RESISTOR LOAD LIFE QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 (INCLUDES T.C.) METHOD PARAGRAPH: 4.6.13 1000 HRS

NOMINAL RESISTANCE 348 K Ω OVEN NO. 2 START DATE 29 AUG 62

CHARACTERISTIC C LOAD VOLTAGE 500V

STYLE RN 65 MAXIMUM SHIFT: ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-31 HR 1600 DC RES. 125°C	% CHG.	100 ± 8 HR. DATE 9-2 HR 1200 DC RES. 125°C	% CHG.	250 ± 8 HR. DATE 9-8 HR 1600 DC RES. 125°C	% CHG.
27	21	349.29	349.72	+.12	349.72	+.13	350.07	+.22
28	22	350.11	350.60	+.14	350.52	+.12	350.79	+.20
29	23	347.99	348.48	+.14	348.41	+.12	348.73	+.21
30	24	348.39	348.88	+.14	348.88	+.14	349.07	+.20
31	25	349.26	349.65	+.11	349.59	+.10	349.84	+.17
32	26	349.49	350.03	+.16	350.01	+.16	350.27	+.26
33	27	350.44	350.99	+.16	350.91	+.14	351.07	+.18
34	28	349.51	349.92	+.12	349.88	+.11	350.00	+.14
35	29	350.41	350.90	+.14	350.89	+.14	351.08	+.19
36	30	350.22	350.70	+.14	350.73	+.15	351.01	+.23

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-19 HR 1000 D.C.RES. 125°C	% CHG.	750 ± 12 HR. DATE 9-29 HR 1000 D.C.RES. 125°C	% CHG.	1000 ± 12 HR. DATE 10-10 HR. 1100 D.C.RES. 125°C	% CHG.	REMARKS
27		350.23	+.23	350.41	+.32	350.33	+.30	
28		350.86	+.22	351.01	+.26	350.90	+.23	
29		348.90	+.26	349.09	+.32	349.02	+.30	
30		349.33	+.27	349.50	+.32	349.44	+.30	
31		349.91	+.19	350.11	+.24	350.05	+.23	
32		350.51	+.29	350.79	+.37	350.70	+.35	
33		351.21	+.22	351.41	+.28	351.26	+.24	
34		350.14	+.18	350.31	+.23	350.21	+.20	
35		351.23	+.24	351.41	+.28	351.41	+.28	
36		351.20	+.28	351.32	+.31	351.20	+.28	

Nathan Pertchen - Eng.

Neil McFarlane Godfrey
USAEMA 10-10-62

MIL R-10509-D **RESISTOR LOAD LIFE QUALIFICATION TESTS** **GROUP IV**

DEFECTS ALLOWED 1 **(INCLUDES T.C.)** **METHOD PARAGRAPH:** 4.6.13 1000 HRS

NOMINAL RESISTANCE 499K Ω **OVEN NO.** 2 **START DATE** 29 AUG 62

CHARACTERISTIC C **LOAD VOLTAGE** 300V

STYLE RN 65 **MAXIMUM SHIFT:** ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-21 HR 1600 DC RES. 125°C	% CHG.	100 ± 8 HR. DATE 9-2 HR 1200 DC RES. 125°C	% CHG.	250 ± 8 HR. DATE 9-8 HR 1600 DC RES. 125°C	% CHG.
16	21	499.06	499.73	+.14	499.81	+.15	500.21	+.23
17	22	497.41	498.15	+.15	498.21	+.16	498.59	+.23
18	23	495.76	496.55	+.16	496.59	+.17	497.02	+.26
19	24	503.99	504.73	+.15	504.69	+.14	505.07	+.22
20	25	501.41	502.12	+.14	502.04	+.13	502.59	+.24
21	26	501.71	502.48	+.16	502.51	+.17	502.93	+.24
22	27	500.29	501.02	+.15	500.99	+.14	501.60	+.24
23	28	503.09	503.84	+.15	503.90	+.16	504.22	+.23
24	29	499.49	500.23	+.15	500.31	+.16	500.71	+.24
25	30	501.20	502.00	+.16	502.01	+.16	502.41	+.24

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-14 HR. 1000 D.C.RES. 125°C	% CHG.	750 ± 12 HR. DATE 9-29 HR. 1000 D.C.RES. 125°C	% CHG.	1000 ± 12 HR. DATE 10-1 HR. 1100 D.C.RES. 125°C	% CHG.	REMARKS
16		500.46	+.28	500.76	+.34	500.71	+.33	
17		498.84	+.28	499.11	+.34	499.11	+.34	
18		497.43	+.33	497.71	+.39	497.71	+.39	
19		505.39	+.28	505.60	+.32	505.69	+.34	
20		502.84	+.28	503.08	+.33	503.05	+.33	
21		503.08	+.23	503.40	+.34	503.31	+.32	
22		501.82	+.31	502.08	+.36	502.08	+.36	
23		504.31	+.24	504.62	+.31	504.61	+.30	
24		500.89	+.24	501.21	+.34	501.20	+.34	
25		502.71	+.30	503.01	+.36	503.01	+.36	

Nathan Pritchard - Eng

[illegible]
USAEMA 10-10-62

MIL R-10509 D RESISTOR LOAD LIFE QUALIFICATION TESTS GROUP IV

DEFECTS ALLOWED 1 (INCLUDES T.C.) METHOD PARAGRAPH: 4.6.13 1000 HRS

NOMINAL RESISTANCE 2 Ω Ω OVEN NO. 2 START DATE 29 AUG 62

CHARACTERISTIC C LOAD VOLTAGE 500 V

STYLE RN 75 MAXIMUM SHIFT: ±(.5% + .05Ω)

SWITCH NO.	RESIST NO.	INITIAL D.C.RES. 125°C 1400 HRS	50 ± 8 HR. DATE 8-31 HR 1600		100 ± 8 HR. DATE 9-2 HR 1200		250 ± 8 HR. DATE 9-8 HR 1600	
			DC RES. 125°C	% CHG.	DC RES. 125°C	% CHG.	DC RES. 125°C	% CHG.
1	21	2.0023	2.0053	+.15	2.0051	+.14	2.0064	+.20
2	22	1.9911	1.9951	+.20	1.9961	+.25	1.9982	+.35
4	24 *	1.9911	1.9911	0	1.9941	+.15	1.9961	+.20
5	25	2.0134	2.0160	+.13	2.0160	+.13	2.0175	+.21
6	26	2.0091	2.0122	+.15	2.0130	+.20	2.0141	+.25
7	27	2.0031	2.0063	+.16	2.0071	+.20	2.0087	+.28
8	28	2.0103	2.0131	+.14	2.0136	+.17	2.0147	+.22
9	29	2.0061	2.0079	+.09	2.0091	+.15	2.0102	+.21
10	30	2.0045	2.0071	+.13	2.0075	+.15	2.0089	+.22
11	23 *	2.0001	2.0001	0	2.0020	+.10	2.0047	+.23

* INITIAL READING DENOTES POOR SOLDER CONNECTION OF RESISTOR TO RACK. (VALUES IN QUESTION)

SWITCH NO.	RESIST. NO.	500 ± 12 HR. DATE 9-13 HR. 1000		750 ± 12 HR. DATE 9-29 HR. 1000		1000 ± 12 HR. DATE 10-10 HR. 1100		REMARKS
		D.C.RES. 125°C	% CHG.	D.C.RES. 125°C	% CHG.	D.C.RES. 125°C	% CHG.	
1		2.0061	+.19	2.0081	+.29	2.0081	+.29	
2		1.9981	+.35	1.9983	+.36	2.0000	+.45	
4		1.9964	+.27	1.9985	+.37	1.9984	+.37	
5		2.0170	+.18	2.0190	+.28	2.0185	+.26	
6		2.0144	+.27	2.0166	+.38	2.0166	+.38	
7		2.0084	+.27	2.0110	+.40	2.0109	+.39	
8		2.0137	+.17	2.0159	+.28	2.0151	+.24	
9		2.0103	+.21	2.0125	+.32	2.0121	+.30	
10		2.0091	+.23	2.0111	+.33	2.0110	+.33	
11		2.0044	+.22	2.0071	+.35	2.0074	+.37	

Nathan Patilon - Eng.

[illegible] USAEMA 10-10-62

MIL-R-10509-D RESISTOR QUALIFICATION TESTS GROUP V

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C

DATE 12 SEPT 62 -1400

STYLE RN 60

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓	49.751			
32	✓	49.572			
33	✓	49.844			
34	✓	50.210			
35	✓	50.159			
36	✓	49.531			
37	✓	49.780			
38	✓	49.565			
39	✓	[illegible]			
40	✓	50.152			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	49.780	+.06	
32	49.597	+.05	
33	49.869	+.05	
34	50.220	+.02	
35	50.225	+.13	
36	49.460	-.14	
37	49.810	+.06	
38	49.600	+.07	
39	50.035	+.10	
40	50.168	+.03	

[illegible] - Eng.

[illegible]
USAEMA 10-10-62

MIL-R-10509-D RESISTOR QUALIFICATION TESTS GROUP V

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

NOMINAL RESISTANCE 200 K Ω

CHARACTERISTIC C

DATE 12 SEPT 62 - 1400

STYLE RN 60

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓	199.73			
32	✓	199.91			
33	✓	199.74			
34	✓	201.04			
35	✓	199.71			
36	✓	200.07			
37	✓	199.33			
38	✓	199.04			
39	✓	199.38			
40	✓	201.18			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	198.63	-.05	
32	200.07	+.08	
33	199.72	-.01	
34	201.05	+.01	
35	199.83	+.06	
36	200.07	0	
37	199.44	+.06	
38	199.11	+.04	
39	199.31	-.03	
40	201.30	+.06	

[illegible] - Engr

[illegible]
USAEMA 10-10-6[illegible]

MIL-R-10509-D RESISTOR QUALIFICATION TESTS GROUP V

DEFECTS ALLOWED 1 METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

NOMINAL RESISTANCE 301 K Ω

CHARACTERISTIC C DATE 12 SEPT 62 - 1400

STYLE RN 60

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓	300.70			
32	✓	299.65			
33	✓	302.38			
34	✓	299.52			
35	✓	299.47			
36	✓	299.80			
37	✓	299.95			
38	✓	299.60			
39	✓	301.86			
40	✓	299.95			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	300.90	+.07	
32	298.76	+.04	
33	302.55	+.06	
34	299.41	-.03	
35	299.47	0	
36	299.69	-.03	
37	300.11	+.05	
38	299.71	+.04	
39	301.45	+.03	
40	299.89	-.07	

[illegible] Eng.

[illegible]
[illegible] 10-10-62

MIL-R-10509-D	RESISTOR QUALIFICATION TESTS	GROUP V

DEFECTS ALLOWED 1

NOMINAL RESISTANCE 49.9 Ω

CHARACTERISTIC C

STYLE RN 65

METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

DATE 12 SEPT 62-1400

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓	49.692			
32	✓	49.681			
33	✓	49.918			
34	✓	49.576			
35	✓	49.658			
36	✓	50.232			
37	✓	49.814			
38	✓	49.832			
39	✓	50.[illegible]			
40	✓	49.704			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	49.690	-.01	
32	49.710	+.04	
33	49.942	+.05	
34	49.594	+.04	
35	49.702	+.09	
36	50.252	+.04	
37	49.838	+.05	
38	49.866	+.07	
39	50.051	+.02	
40	49.725	+.04	

[illegible] - Eng.

[illegible] USAEMA 10-10-62

MIL-R-10509-D RESISTOR QUALIFICATION TESTS GROUP V

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

NOMINAL RESISTANCE 348 Ω

CHARACTERISTIC C

DATE 12 SEPT 62 -1408

STYLE RN 65

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓	346.77			
32	✓	345.71			
33	✓	350.24			
34	✓	350.08			
35	✓	349.05			
36	✓	349.31			
37	✓	348.51			
38	✓	348.66			
39	✓	346.69			
40	✓	349.47			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	346.85	+.02	
32	345.80	+.03	
33	350.41	+.02	
34	350.28	+.06	
35	349.12	+.02	
36	349.34	+.01	
37	348.53	+.01	
38	348.71	+.02	
39	346.72	+.01	
40	349.54	+.02	

[illegible] Eng.

[illegible] 10-10-62

MIL-R-10509-D	RESISTOR QUALIFICATION TESTS	GROUP V

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

NOMINAL RESISTANCE 499K Ω

CHARACTERISTIC C

DATE 12 SEPT 62 - M10

STYLE RN 65

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓ [illegible]	499.07			
32	✓ [illegible]	497.01			
33	✓ [illegible]	499.30			
34	✓ [illegible]	497.41			
35	✓ [illegible]	495.69			
36	✓ [illegible]	495.51			
37	✓ [illegible]	500.05			
38	✓ [illegible]	499.43			
39	✓ [illegible]	495.72			
40	✓ [illegible]	502.00			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	499.24	+.03	A 1 MILLISECOND "PIP" WAS IN
32	497.29	+.06	EVIDENCE DURING SHOCK TESTS
33	499.45	+.03	ON THIS GROUP
34	497.38	+.01	
35	495.72	+.01	
36	495.68	+.03	
37	500.22	+.03	
38	499.64	+.04	
39	495.93	+.04	
40	501.91	-.02	

Nathan Putnam Eng. [illegible] USAEMA 10-10-62

MIL-R-10509-D RESISTOR QUALIFICATION TESTS GROUP V

DEFECTS ALLOWED 1

METHOD PARAGRAPH: 4.6.14, 4.6.15, 4.6.16

NOMINAL RESISTANCE 2 M Ω

CHARACTERISTIC C

DATE 12 SEPT 62-1400

STYLE RN 75

RESIST. NO.	SOLDERABILITY METH. PAR. 4.6.14	SHOCK (30" DROP) METHOD PAR. 4.6.15			
	INSPECTION	INITIAL D.C. RES	FINAL DC RESIST.	% CHG. ±(.25%+.05)	DISCONTINUITY DURING SHOCK
31	✓	2.0021			
32	✓	2.0002			
33	✓	2.0099			
34	✓	2.0062			
35	✓	2.0040			
36	✓	1.9961			
37	✓	1.9939			
38	✓	2.0052			
39	✓	2.0150			
40	✓	1.9970			

RESIST. NO.	HIGH FREQ. VIBRATION METHOD PAR. 4.6.16		REMARKS
	FINAL D.C. RESIST.	% CHG. ±(.25%+.05)	
31	2.0040	+.10	A "PIP" OF ABOUT 1 MILLISECOND
32	2.0022	+.10	DURATION WAS EVIDENT IN THIS
33	2.0099	0	GROUP DURING THE SHOCK TEST.
34	2.0075	+.06	
35	2.0055	+.08	
36	1.9981	+.10	
37	1.9960	+.10	
38	2.0075	+.11	
39	BROKEN	—	RESISTOR CRACKED WHEN CONN
40	1.9984	+.07	FIXTURE TO VIBRATION FIXTURE
			SHORTED OUT & CONTINUED TEST

Nathan Dutchen - Engr.

[illegible] USAEMA 10-10-62